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The New Reid Chuck.

The chuck illustrated on this page is an improvement on the one heretofore made by C. H. Reid, at Danbury, Conn.

The improvement consists in necking the screw in the center instead of at the ends (see Figs. 1 and 3), which gives it a more solid and a better support than could otherwise be obtained, besides giving a much larger opening through the chuck in which to place the drill or work.

Under the new construction, the chuck jaws will not extend beyond the diameter of the body of the tool, when open to their maximum, as in Fig. 1. Fig. 4 shows that the grip is long and direct, that the bearing is as good in the rear as at the front of the jaws, and that the strong differential screw acts at right angles with the work held between the V's of the jaws, pressing them together equally their entire length, and thus exerting a more powerful hold than can be obtained by other means; also that in this chuck there is no tendency to spread the jaws so that they will open more at the front than at the back end.

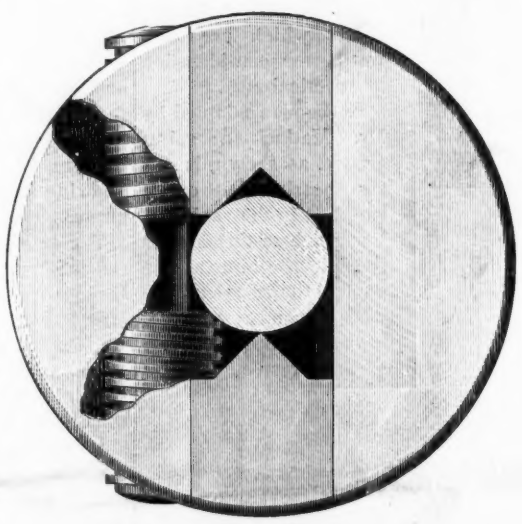
Fig. 5 illustrates the V bite of the jaws, the means by which they are held firmly to their work in the body of the chuck, and the solidity of the parts. The parts are made of the best steel and the jaws are left very hard, which preserves the truth of the tool. The various pieces are made interchangeable, so that if from any cause a new screw or other part is required, it can be duplicated without the necessity of returning the chuck to the factory.

Fig. 6 shows the inch and inch and a quarter chuck provided with a taper recess, extending into the back of the tool, into which can be fitted a corresponding bush. A long bearing surface is thus provided for keeping the two true—the one with the other. This causes the tool to run true and stiff, which makes it a very desirable chuck for hand-tool work and brass finishing.

This chuck is very simple in the arrangement of its parts, which are but four in number. It will hold flat as well as round drills, or material for turning, &c., as in making screws from long stock, and is especially desirable in work requiring a strong and solid grip.

Fig. 7 shows the chuck threaded and screwed on the nose of a hollow spindle, which enables the drill to be slipped through the chuck and into the spindle, thereby shortening the overhang and stiffening it. It also increases the capacity of the drilling machine or lathe on which it may be used. This arrangement also enables the workman to use long stock from which to make screws, dowel pins, and other work of a like nature, making a saving in time and stock, for when this or any other chuck is connected with the spindle with a collet, as illustrated in Fig 8, long work cannot be passed through the hollow spindle, and the point of the drill is carried so much further from its support.

R H. Brown & Co. are making this chuck at New Haven, Conn., and are at the present time completing a new shop for its manufacture. Felix Chillingworth, New Haven, Conn., is general agent for the sale of this chuck.



FIGS. 1 AND 2.

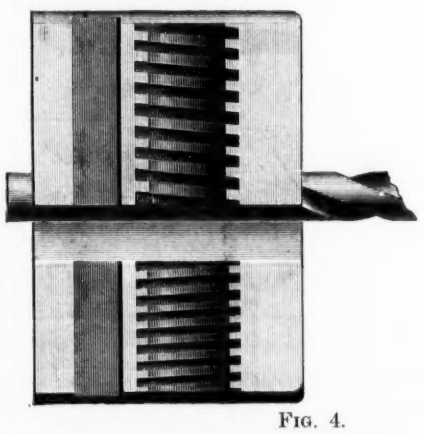


FIG. 4.

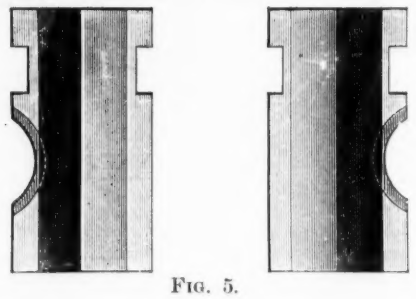


FIG. 5.

FIG. 3.

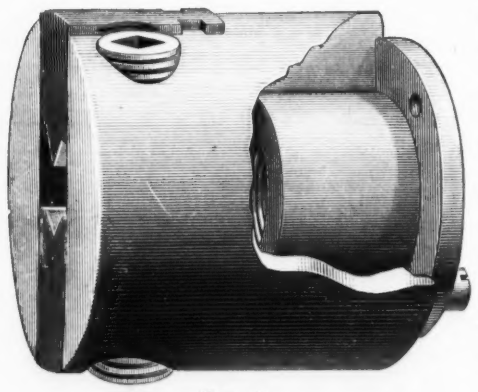
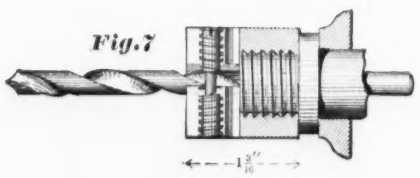
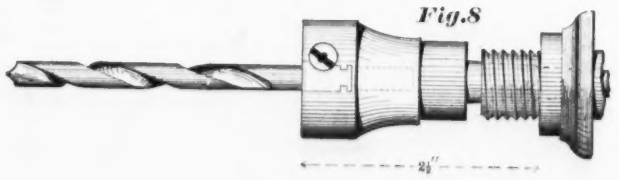


FIG 6.





It is said that the cotton mills in the State of Alabama paid, last year, a dividend of 15 per cent. The iron industries in that State are also said to be in a flourishing condition.

Interchangeability in the Elevated Railroad Shops.

BY ANGUS SINCLAIR.

At the corner of 98th street and 3d avenue, New York, is the mechanical headquarters of the Manhattan Elevated Railway. When the visitor climbs a series of stairways and reaches the master mechanic's office, he gets ushered into an enclosure of shops and yards which cover two blocks. First we reach a large oblong building, about 550 feet long by 140 feet wide, which is the storage house for locomotives and cars. The house is divided longitudinally into three apartments, each traversed by four tracks. In one place cars are placed for light repairs and painting, in the next the cars are housed when they are not on the road, and here they are cleaned and inspected. The third section of the building is occupied by locomotives, and performs the functions of a round-house. As no engines are turned on this line but keep running headed in one direction, the necessity for turn-tables is avoided, and the short engines can be more compactly housed in a long house than they could be in a round house.

When a locomotive comes in from a series of trips, the engineer leaves her on the pit outside the engine house, and reports whatever work he may think necessary. The fire of the engine is cleaned outside but not drawn, then she is run on to one of the tracks in the house where she is subjected to a searching inspection by a competent machinist, whose special business it is to detect the trifling defects which lead to accidents when they are neglected. Any running repairs that are needed are performed here, and a force of men is ready to clean up the engines and get them in order for the next turn of service. Part of the engine house is partitioned off as a small machine shop, and contains the tools necessary for convenience in effecting running repairs.

The shops are excellently arranged for doing work with the least possible handling of material, and the perfect way in which every detail of the system is carried out, reflects credit upon the executive ability of T. W. Peeples, the general master mechanic.

At the end of the engine house is the machine and repair shop, a two-story building 200x125 feet. In keeping the 240 locomotives belonging to the company in proper working condition, they are passed through the shops nearly in rotation, getting a thorough overhauling of every part that needs refitting or renewing. In this course of

work fifteen engines go through the shops every month.

The greater part of the locomotives used on the Elevated Railroad are of the Forney type. The ruling dimensions are cylinders 10x16 with two pairs of coupled drivers 42 inches diameter. About 350 square feet of heating surface provides steam for doing the work which is performed very economically, hard coal being the fuel used. A close account of the fuel consumed is kept, every pound given out being weighed. By this means there is no difficulty in discovering any engine that is making a bad record.

In addition to being smaller than the ordinary locomotive, these engines possess certain peculiarities that are confined to this road. They do not exhaust the steam direct into the smoke stack but into a chamber placed at the base of the smoke-box from whence it escapes through an inverted perforated cone with about 200 holes aggregating about 4 inches diameter of circular opening. This plan of a perforated exhaust works well and freely makes all the steam required, besides muffling the noise caused by the escaping steam. An arrangement which works with nearly 4 inches diameter of exhaust opening for 10x16 cylinders seems worthy of more extended application. Mr. Longstreth of the Baldwin Locomotive Works is inventor of the system of a separate exhaust chamber. The company made the addition of the perforated cone, and they have a plan of making an enlarged exhaust pipe which serves the same purpose as the separate chamber.

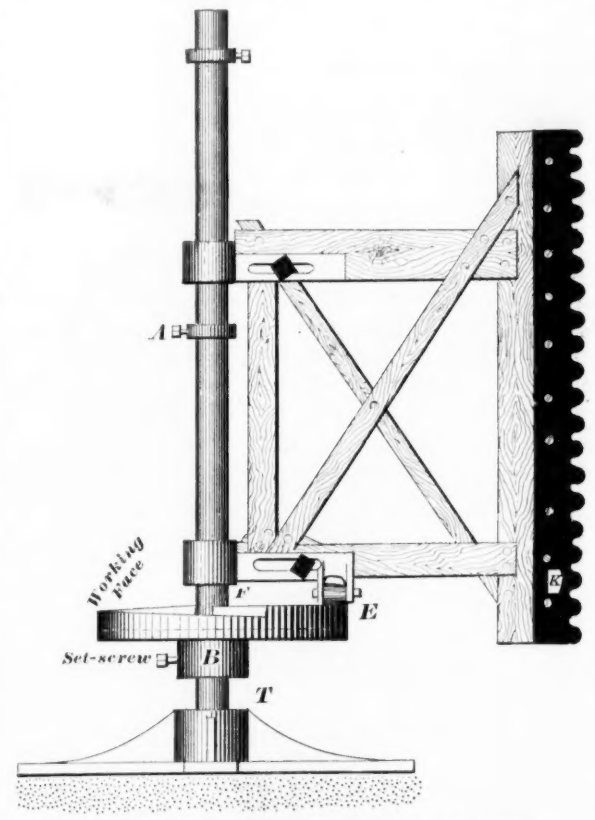
In performing all repair work, an excellent system of interchangeability of parts has been adopted. As far as practicable, the whole of the engines, although of different makes, are reduced to a standard for which gauges are made, and all work is made to coincide with the gauges.

By this means, rods, boxes, brasses, bushes and so on, can be finished and kept in stock ready to be put in place when required. Three different sizes of each fitting are used, so that when an article gets worn it can be reduced to fit the size below or bored out or planed to suit the size above. Thus, in the case of rocker pins, there are three diameters—*A* 1″, $B 1\frac{1}{16}$″, $C 1\frac{1}{16}$″. *A* is the original size, and is kept in the middle, one size being larger and the other smaller. The bushings for these pins are arranged in the same manner.

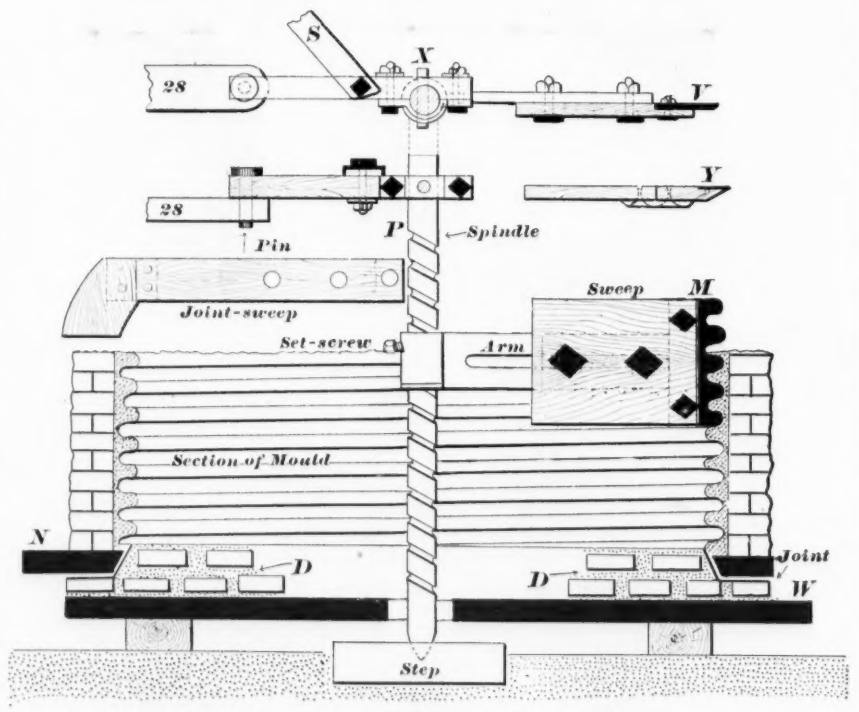
Now, we will suppose that engine No. 1 is shopped for repairs, among which are new pins and bushings of valve rods. The pins taken out were the size *B*. They were worn and could not be trued to a smaller size, so they are consigned to the scrap heap, and new pins $C 1\frac{1}{16}$″, the largest size, put in. When this pin gets worn, it can be turned down to *A* 1″, and again from that to $B 1\frac{1}{16}$″. Then its course is run. The same is the case with the bushings. They go through a course of three changes of size before they become worn out. As every change of size is made to gauge, there is no necessity of keeping the parts for the engine they originally belonged to. When the engine reaches the machine shop, she is stripped, and the fittings, kept finished in stock, are used for the rebuilding. The worn parts go through the machinists' hands without any consideration of the engine they come from; and when the refitting is completed, each part is stored away ready for any engine that may require it. Wedges, shoes, driving boxes, side rods, injectors, ejectors, brake attachments and other parts are subjected to this system of interchangeability. By this means work is remarkably expedited, and expenses of doing repairs greatly reduced. To work into such a system requires the expenditure of much thought and labor, but it pays good interest on the investment. It would pay even better on roads that are short of power occasionally, where the prompt repairing of a disabled engine helps to keep the road from getting blocked with freight.

It often happens at certain periods of the year, that the services of locomotives are worth to railroads four times the money that they are in other parts of the season; and at the most inconvenient times engines will come in broken down, and have to remain in the shop two or three days for repairs. Take the common incident of a broken cross-head, which has let the piston through the front cylinder head and cracked the spider. If the cylinder casting is not broken, this mishap could be repaired by the Elevated Railroad's method of doing work in about three hours, for all the parts are in stock ready to replace the broken pieces. With the cut-and-try system the work of doing these repairs would take about three days.

Bronze driving boxes are used on all these engines, and it is found cheaper than the old cast-iron boxes, and, of course, it ends the common trouble of loose driving-box brasses. All the engines have driver brakes, which are operated separate from the train brake, but each one is worked by a vacuum diaphragm placed under the boiler. A No. 4 Monitor injector is found sufficient for water feeding, and no pumps are put on the engines. Paper wheels are used exclusively, cast-iron wheels not having been deemed sufficiently trustworthy. The repairs in the shops are carried out as much as possible on the division-of-labor plan. The same set of men are kept on the same class of work as far as practicable in a railroad shop. When the machinery and fittings of an engine are taken into the shops for repairs, each part goes regularly to the same place, and every man around the establishment knows just what his portion of the work is. When anything is passed out in an imperfect state, the party to blame can by this means be identified easily. J. D. Campbell, the foreman of the shops, takes enthusiastic interest in perfecting the details of their system and carrying out the work. About 350 men are employed in the establishment.



HAMILTON'S PLAN OF SWEEPING GROOVED DRUMS.



MATLOCK'S PLAN OF SWEEPING GROOVED DRUMS.

Sweeping Grooved Drums in Loam.

BY THOS. D. WEST.

The two engravings, each representing a different plan of sweeping a large grooved drum in loam, are not only instructive in so far as they represent practical processes, but are interesting as showing that the trade of the moulder demands the exercise of talents of a high order. I am indebted to the courtesy of David Matlock, manager of the I. P. Morris Company's foundry, Philadelphia, and Thomas Hamilton, of the Hamilton Works, Youngstown, Ohio, for being able to present to the readers of the AMERICAN MACHINIST these plans, which are well worth the consideration of practical men.

In the plan adapted by Mr. Matlock a spiral groove, as shown, is cut for nearly the entire length of the spindle. The pitch of this groove is made the same as the pitch of the grooved drum is to be, and a set screw projects through the arm of the sweep and enters the groove in the spindle. Of course, it is plain that in revolving the sweep, it will have a corresponding spiral movement.

Mr. Hamilton's plan involves the use of a plate *B*, the working face of which is turned up in a screw-cutting lathe to the desired pitch. At *F* is represented a piece about 8″ long, dowelled to the main plate so as to be readily removed. The roller at *E* permits the sweep to be easily revolved. The drums, for the making of which this plan was originated, were 14 feet diameter and 7 feet 4″ in length. They were stiffened by inside ribs and flanges, and had 6″ outside flanges at ends. They were poured by dropping the metal from the top, and when done were first-class castings.

I will not dwell upon forming the inside of the drums, as that is a matter of secondary importance compared with sweeping the grooves. In starting to make a mould such as shown in the section, after the bottom plate *W* is set and the spindle erected, the joint sweep is attached and the outside circumference of the bottom of the mould and the parting joint swept up. The reason for not sweeping up the inner portion of the bed is to leave room to stand, and to allow space for the loam that will drop when sweeping the outside, which is formed and lifted off The inner portion is then built up and swept level by attaching a straight sweep. In building up this bottom, the bricks should be built very open, as represented at *D*, *D*, and the space partly filled with cinders, there being brick-work between the parting ring and bottom plate, as shown. The bottom vent can thereby be drawn to the circumference and carried up and off at the top. After the bottom joint is finished and parting made ready, the parting ring *N* is set on, and the outside portion of the mould built and loamed up.

In the loaming, or sweeping up of the mould, a straight sweep is generally first used, after which this is detached and the sweep for forming the grooves attached. In both cuts the grooved portion of the sweep is shown in black. This portion of the sweep could be made of sheet or boiler iron plates, as the projections are very easily broken if of wood; or this portion could be wood, faced with a thin sheet-iron plate, as represented at *Y*. This strengthens the wood, and prevents the working edge of the sweep from rapidly wearing away. At *V* the working portion of the sweep is shown to be all iron, made so as to be removed, thereby allowing for attaching either a straight or a grooved sweep, as shown at *M* and *K*.

The cut of Mr. Hamilton's rigging shows the inclined plate in place ready to sweep the grooves. This plate is not so placed until after the mould is roughly swept up with the straight sweep, which is done by letting the sweep and rest revolve upon the collar *A*, the incline plate *B* having been lowered to the bottom holding-step *T*. Then, after the straight sweep has done its work, the inclined plate is raised to its proper position, and held by the set screw, shown in *B*, after which the collar *A* is dropped out of contact, so as to allow the sweep to travel in a spiral direction. The sweep starts at *F*, and when it has passed away from *F* this piece is removed, allowing the sweep to travel more than the whole circumference of the grooves. The sweep is then returned, *F* being replaced and another revolution is made, and so on to the end.

In loaming, or sweeping up the grooves, the method adopted should depend upon the size or pitch of the grooves, and also the nature of the loam. If the grooves are not over $\frac{3}{4}$″ deep, and the loam a fair stiffening kind, the grooves may be swept up without much delay. But should the loam be a slow-stiffening kind, it might be advisable to dry the inside of the mould with a basket fire, having the top of the mould covered over with sheet-iron plates. This plan in the case of larger grooves, with the best of loam, might often be advisable.

In the case of very large grooves, it might be necessary to use the groove sweep when building up the brick-work, so as to build the bricks projecting into the grooves, which would, of course, often necessitate breaking the bricks. Again, loam bricks or cakes might be made the circle and thickness wanted, and when building up the mould use a four-inch common brick wall upon the outside of the loam cakes. The cake being made the proper size for the job, there should be very little time lost in waiting for the loam to stiffen when sweeping up the mould. The above plans are only given as ideas, as I could not recommend any plan unless the special requirements of a job are known. However, they all are worth remembering, as with a little judgment it would be but a simple matter for one to know which would be the best to adopt for his special job.

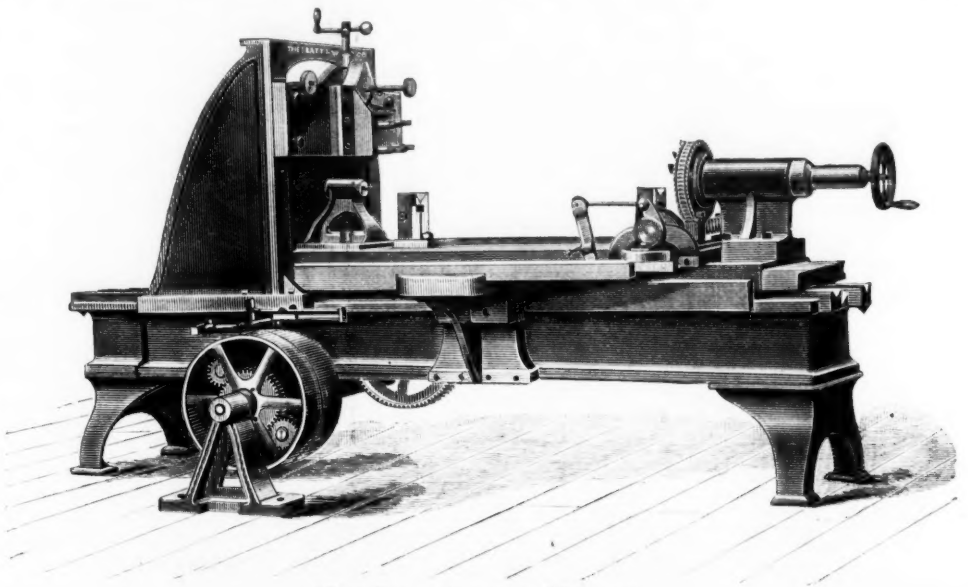
The details of any work of this character call for the exercise of individual judgment on the part of the moulder, as no cast iron rules can be made for jobs that in each case will probably possess peculiar features.

New Special Machine Tools.

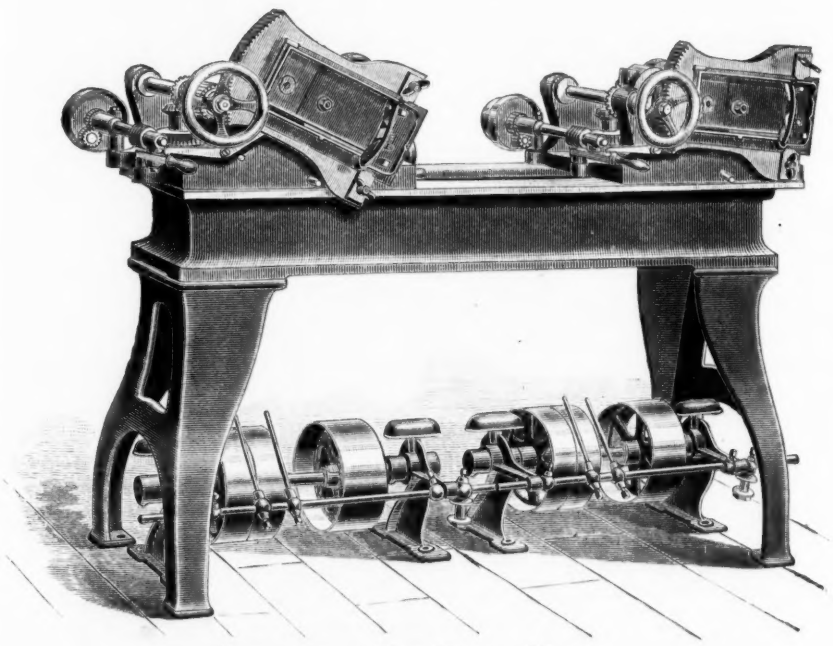
We illustrate with this three special machine tools brought out by the Pratt & Whitney Co., Hartford, Conn. The roll-grooving machine is especially designed for grooving rolls for grinding grain. The basis of this machine—that is, the bed, table, arrangement of tool, &c.—is the same as that of a planing machine. The roll to be grooved is held in a special appliance so arranged that it is revolved and finished by the automatic operation of the machine. As milling rolls are made of chilled iron, the cutting speed is three feet and the return speed forty feet per minute. This machine will finish rolls up to 12″ diameter and three feet in length, cutting any desired number of grooves, and at any angle up to 32° with the axis. The countershaft has 22″ pulleys with 4″ face. Total weight of machine, 10,000 lbs.

The double spindle milling machine is designed for milling sewing machine work, particularly the faces of arms and face-plates. Each of the spindles are adjusted independently, so that roughing and finishing cuts can be taken without the necessity of removing the piece or making special adjustments. There is an aperture in the sliding table, through which right angle or projecting parts of work up to 20″ in length can be placed, thus providing for doing a class of work that cannot be done on the ordinary milling machine. All parts are arranged for rapid manipulation. The weight of this machine is 1,500 lbs.

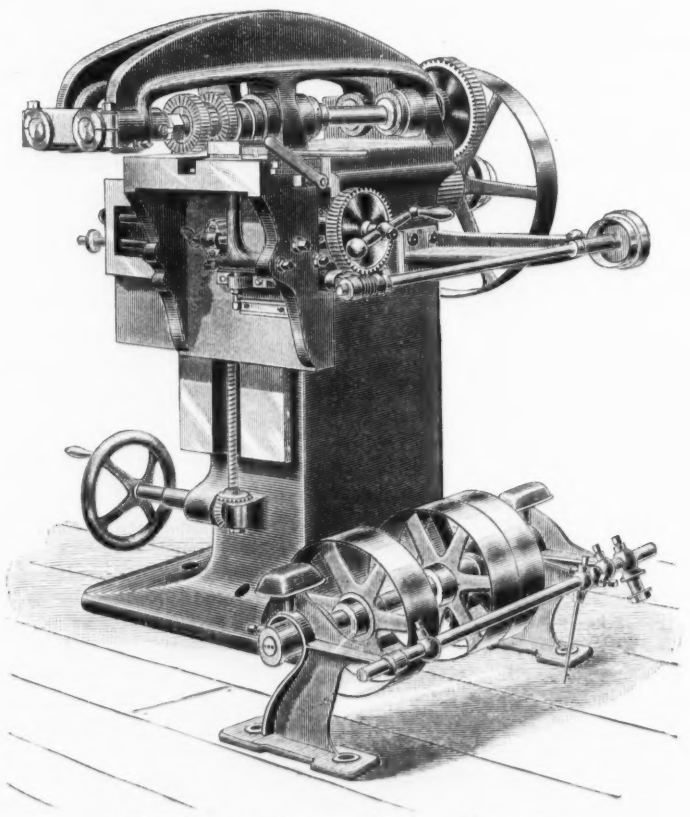
The shuttle race milling machine is for milling the circular shuttle races in the beds of sewing machines. It is especially designed to do the work with but little attention from the operator, being provided with automatic feed, and a stop motion to avoid doing damage by running too far. It is compact and solid, and will do excellent and rapid work. Weight, 1,000 lbs.



NEW ROLL GROOVING MACHINE.



NEW SHUTTLE RACE MILLING MACHINE.



NEW DOUBLE SPINDLE MILLING MACHINE.

Notes on a Hoisting Engine Works.

The Lidgerwood Manufacturing Company have got their new shops, at the corner of Dikeman and Ferris streets, Brooklyn, N.Y., in good working order. They are quite busy on their specialty of making all sorts of hoisting machinery. About 100 men are employed during the day, and they are working 25 men all night. The United States Electric Light Company's system supplies light for the night workmen. The new shops are built in the form of a hollow square. The machine shop is 200x75 feet. The boiler shop is built of L shape, one side being 120 feet, the other 110 feet long, and both sections are 50 feet wide. The foundry, with the blacksmith's shop, the offices and storehouse complete the outside of the square. Although work is being carried on in all the shops, the machine shop alone is completed. It is very well arranged for the convenient handling of the work in course of construction. The shop is 2-story high, the upper floor being in the form of galleries with a long opening in the middle. This plan gives the means of lighting the shop very effectually. Along the opening in the upper floor two traveling cranes 75 feet wide traverse the whole length of the shop and are used to transfer the heavy machines to different parts of the shop. Each crane is capable of lifting six tons, and they are used conjointly for moving loads up to their combined capacity. Differential pulleys are stationed at various points of the shop, and are found of much service in moving the heavy parts of machines that are being fitted up on the floor. A great many of the hoisting machines made weigh in the neighborhood of 10 tons. By the aid of differential blocks one or two men can handle all the fittings with ease and comfort. Double plank flooring 4″ thick covers all the ground floor of this shop and is sufficiently strong to sustain the numerous heavy machines in different stages of completion. Everything is clean and neat. A place for everything and everything in its place seems to be the rule of the establishment. The greater part of the hoisting machines lying round are such as are used about docks and on board steamships for handling freight. Some of them are portable and carry their boiler along, others are stationary with boilers attached, and in many cases the machine is made without a boiler, pipes being provided for bringing steam from a distance. One large machine in the shop has four winding drums and is intended for operating two miles of an underground railroad.

James Henderson Bellefonte, Pa., has patented an improvement in iron and steel making. It consists of subjecting the molten metal to the action of air jets in a basic lined chamber where it gets desiliconized. Then it is treated with air and steam blasts to remove the phosphorus, and finally mixed with a compound of iron, carbon and manganese to give steely properties to the metal.

This last process resembles the plan of charging Bessemer furnaces with ferro-manganese

Locating Link Saddle Studs.

In locomotive building shops, even where a good template system is in use, it is customary to leave the locating of the link saddle stud till the time of setting the valves. The ordinary practice is to clamp the saddle to the link till the cut-off is equalized, then locate the stud point. Mr. Myers, chief draughtsman of the Grant Locomotive Works, has introduced an innovation on this time-honored but inconvenient practice. He lays off the position of the stud on the drawing, and a template is made for the saddle from the data furnished, just the same as for any other part of the engine, and the cut-off comes out right every time.

Interest in the Locomotive.

It is curious to observe how interested all classes of railroad men are about anything relating to the locomotive. This feeling of interest is not confined to those immediately connected with the machinery department where talking shop naturally finds the locomotive a fertile subject. From the verdant brakemen beginning to run "extras" to the veteran manager, all the men and officials pride themselves on knowing something not altogether elementary about the locomotive. The locomotive stands out a prominent figure in railroad operating, and the intelligent portion of the employes try to comprehend the principles of its operation. Owing to this sentiment nearly all railroad journals like to publish locomotive articles, and they find that no other class of matter is so universally read.

Recent Railroad Progress.

The most important event in railroad progress that has occurred this year is the completion of the main line of the Northern Pacific, making a continuous road of 1,887 miles from New Tacoma, on Puget Sound, to Duluth, Minn. This is said to be the longest railroad in the world under one management. The Northern Pacific road (with its branches) opens up to settlement a large portion of the United States, presumably rich in natural resources, which has hitherto remained in native wildness. The prospects are good for its rapid development.

The New York, West Shore and Buffalo Railroad, which was opened for traffic from Jersey City to Albany in July, will probably be completed to Buffalo some time this Fall. The track is completed as far west as Syracuse. This road has required exceptionally heavy grading and tunnelling, and the work has been done in a very substantial manner. The rolling stock is of the best kind, and the road promises to be popular with the traveling public. In a personal letter Mr. W. P. Clark, superintendent of construction, mentions that every one connected with the work is busy pushing towards completion of the road.

The Chicago and Northwestern Railroad is extending from Hawarden, Ia., to Iroquois, Dakota, 126 miles.

The Kansas City, Fort Scott and Gulf Railroad is extending from Springfield, Mo., to the Mississippi River opposite Memphis, 275 miles. Over half of the extension is completed.

The New York, Texas and Mexican Railroad is to run from Victoria, Texas, to Brownsville, Texas, on the Rio Grande River, 215 miles. About 100 miles are now in operation.

Quite a number of other new roads and extensions are in progress. Something over 3,500 miles of track has been laid this year against twice that amount to the middle of September last year

Bricks that have previously been impregnated with asphalt, have been tried for pavement in Berlin. They are laid on a bed of beton, and are said to resist wear better than any material previously tried. The trial was made in places, where from hard usage other materials had failed in a very short time.

First Attempt to Burn Anthracite Coal in Locomotives.

The first systematic attempt to burn anthracite coal in American locomotives was made on the Philadelphia and Reading Railroad, about the year 1836. The principal hauling business of the company was anthracite coal, and it was considered an anomaly that the locomotives doing the work should be fired by wood. An English inventor proposed a method of preparing anthracite so that it would be burned in the common fireboxes, and he was backed by the McCalmonts, who were large stockholders of the road. His plan was to grind up the anthracite coal and mix it with coal tar and asphalt or bitumen, and mould the mixture into bricks which had a block of wood in the middle. Machinery was made and erected for grinding the coal, which was the very best that could be selected. Great quantities of the bricks were made, and the trial to burn them commenced.

When the fire was started, the bituminous matter and wooden blocks enveloped inside the bricks would get up an intensely hot fire, but gradually the anthracite dust would settle down to the grates and cover them over with a compact mass which would not burn and prevented the air from getting through to supply the upper part of the fire with the oxygen needed for combustion. Then they would have to stop and clean out the fire and begin again. Part of the anthracite dust would burn while it was in contact with the glowing wood and bitumen, but there was too limited grate area to admit of the dust settling and remaining incandescent. A vigorous effort was maintained to make that system of anthracite burning succeed, but it would not work and had to be abandoned.

The Denver *Journal of Commerce* says: "Last year the people of Colorado paid the Western Union Company—that gigantic monopoly—the snug little sum of $350,000 for messages sent over their wires. Now this sum will seem the more enormous when we state that the entire plant belonging to the Western Union in Colorado cost but $125,000."

A like proportion of cost to yearly revenue will probably hold good in other States. After a U. S. Government postal telegraph is established the people will wonder how they meekly submitted so long to the greedy imposition of an unscrupulous monopoly.

Brakes on the Denver and Rio Grande Railroad.

The Denver and Rio Grande Railroad has one of the most effectual and reliable systems of train brakes in the world. Good brakes are especially needed to control the speed of trains on that road where high mountains are climbed, where heavy grades are the rule and level track the exception. For many miles this road winds its course round the edges of terrible canons and hugs the sides of towering precipices, where loss of train control would lead to certain destruction. The Westinghouse automatic brake is used on the whole equipment, freight and passenger trains being controlled in that way. All the locomotives have the Westinghouse driver brake, operated by air, and they have in addition the Lechatalier water brake. We are not aware of this water brake being used on any other road in this country. It is a French invention, and consists of a jet of water and steam thrown into the exhaust pipes, so that the engine can be run in reverse motion without injury to the rubbing surfaces. When the engineer commences descending a long, heavy grade, he reverses his engine, opens the cylinder cocks, and applies the water jet. By this means the cylinders are made to assist in controlling the train down the grade, and the action of the pistons does not suck dirt and cinders from the smoke box, as is usual with a locomotive working in reversed motion.

An insurance firm that evidently keeps up with the times, advertises thus in one of our Western exchanges: "Cyclone, wind, and tornado insurance written on your property; don't delay; get it before we have another."

Refrigerating Air by Mechanical Means.

The report of the Board of United States Naval Engineers on the air-refrigerating machine in Thirty-fourth street, New York, shows that the air cooling is obtained by entirely mechanical means. The air is compressed in cylinders, which are water-jacketed so as to absorb the heat of compression.

A pipe area through which the compressed air passes is exposed to the external atmosphere, and takes off part of the heat. The compressed air then passes into cylinders, where it is caused to perform work by expansion, which depresses the temperature close to the freezing point. To perform a greater amount of work by expansion would further reduce the air temperature, were that desirable.

When the air is first compressed it parts with most of its moisture, which is trapped in the convey pipe. In refrigerating machines it is important that this moisture be carried off, or it would cause trouble with ice in the expanding cylinder.

The engine driving this machine is a most wasteful concern, wire-drawn steam being used without any expansion in an unjacketed cylinder.

Careful experiments and calculations were made to ascertain the expense of chilling air by compression, to see if it was practicable to provide hospitals and ships with air cooled by mechanical means. The conclusion arrived at was that the expense would be so great, even when the best forms of engines and machines were used, as to preclude the employment of refrigerated air for ordinary sanitary purposes.

Personal.

Chas. A. Bauer has resigned his position of Superintendent of the Champion Bar and Knife Company and Champion Malleable Iron Company's Works at Springfield, O., to accept the position of General Superintendent of the Lagonda Works of Warder, Bushnell & Glessner, in the same city. Mr. Bauer's mechanical management of the two former establishments has been eminently successful. The *Springfield Republic* says:

* * * A great number of the finest machines in the bar and knife shops, and in the departments where the cotters and tiers are manufactured, were made from original plans and draughts prepared by Mr. Bauer, and executed in the shop under his supervision. These are among the finest machines in the entire stock of machinery, and furnish a lasting monument to his mechanical skill. A great number of the machines also which are purchased must be adapted and adjusted to the peculiar work required of them, and this alone has drawn largely on the skill of Mr. Bauer. We were especially pleased with a department in the knife and bar where tools such as drills and punches are manufactured, and where heavy machinery for various purposes is in process of construction.

* * * * * *

The principle has been that whenever work of a certain character needed to be done, a machine was especially constructed to do it. An extremely pleasant feature was the sympathy which seems to exist between Mr. Bauer and the workmen of the shops. He seems to be intimate with almost every hand in the entire works, and is always ready with a pleasant word, or an answer to a question. During the eight years of his superintendency his relations with the workmen and foremen under him have been of the most pleasant character, and he severs his connection with the knife and bar and malleable shops with the kindest regards and best wishes of all the employes there.

The steamer Normandie of the Compagnie Générale Transatlantique line, had a narrow escape from a break down in mid-ocean on her last voyage from Havre. The engineer on watch suddenly heard a pounding in one of the cylinders, and he immediately shut off the steam. After a consultation, it was decided to remove the head for examination. When this was done, a loose bolt was found on top of the piston. Had the stop not been made promptly, the probability is that the head would have been broken. It is supposed that the bolt had been carelessly left in the steam pipes or ports during the course of an inspection while in port.

Lidgerwood Double and Portable Hoisting Machines.

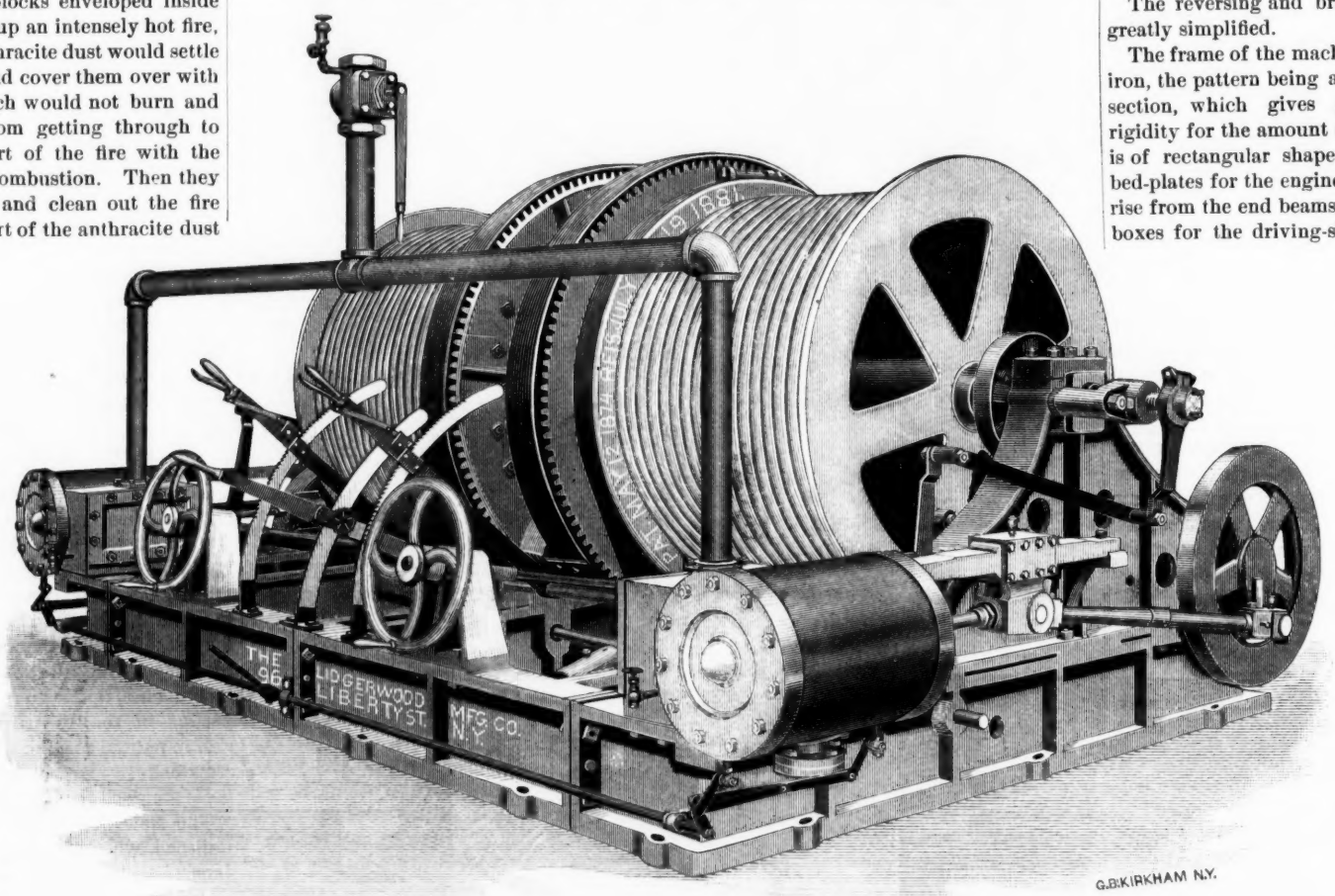
The engraving of the double cylinder stationary reversing hoisting machine is of one made by the Lidgerwood Manufacturing Company, 96 Liberty street, N. Y.

This company confine themselves exclusively to the construction of hoisting machinery, and their experience with this specialty has enabled them to develop and perfect the machine—for working constantly upon it has given them the opportunity of detecting and correcting original faults of design, and of strengthening the parts experience had indicated as showing weakness. They have also paid particular attention to methods of reducing the number of working parts till the machine shown is a model of simplicity and compactness.

It combines several new features about the gear that controls the friction drums. This was formerly done by a chain arrangement which is dispensed with and levers are substituted.

The reversing and braking gears are also greatly simplified.

The frame of the machine is of heavy cast-iron, the pattern being a double flange beam section, which gives great strength and rigidity for the amount of material used. It is of rectangular shape, the ends acting as bed-plates for the engines. Heavy brackets rise from the end beams which support the boxes for the driving-shaft and drum-shaft. Near the middle of the drum-shaft are two heavy spur-wheels which receive their motion from gears on the driving-shaft. The outside end of each spur-wheel is turned out in the frustum of a hollow cone, into which the end of the drum formed of a conical wooden friction-block can be impressed. This drum runs loose upon the shaft, and can be readily pushed on to the spur-wheel by a lever at the end of the bearing which operates a coarse pitch screw that presses the two cones, concave and convex into contact. This, as is generally conceded, is a much smoother and quicker means of operating than with the old-fashioned clutch, and all jarring, jerking and violent strains are avoided by its use, increasing the durability of the machine. Another desirable point about this form of hoisting apparatus is its comparatively noiseless action The drums can be worked separately or combined at the will of the operator. All the levers for operating the machine are conveniently located close to the hand of the man in charge.



DOUBLE CYLINDER REVERSING HOISTING ENGINE.

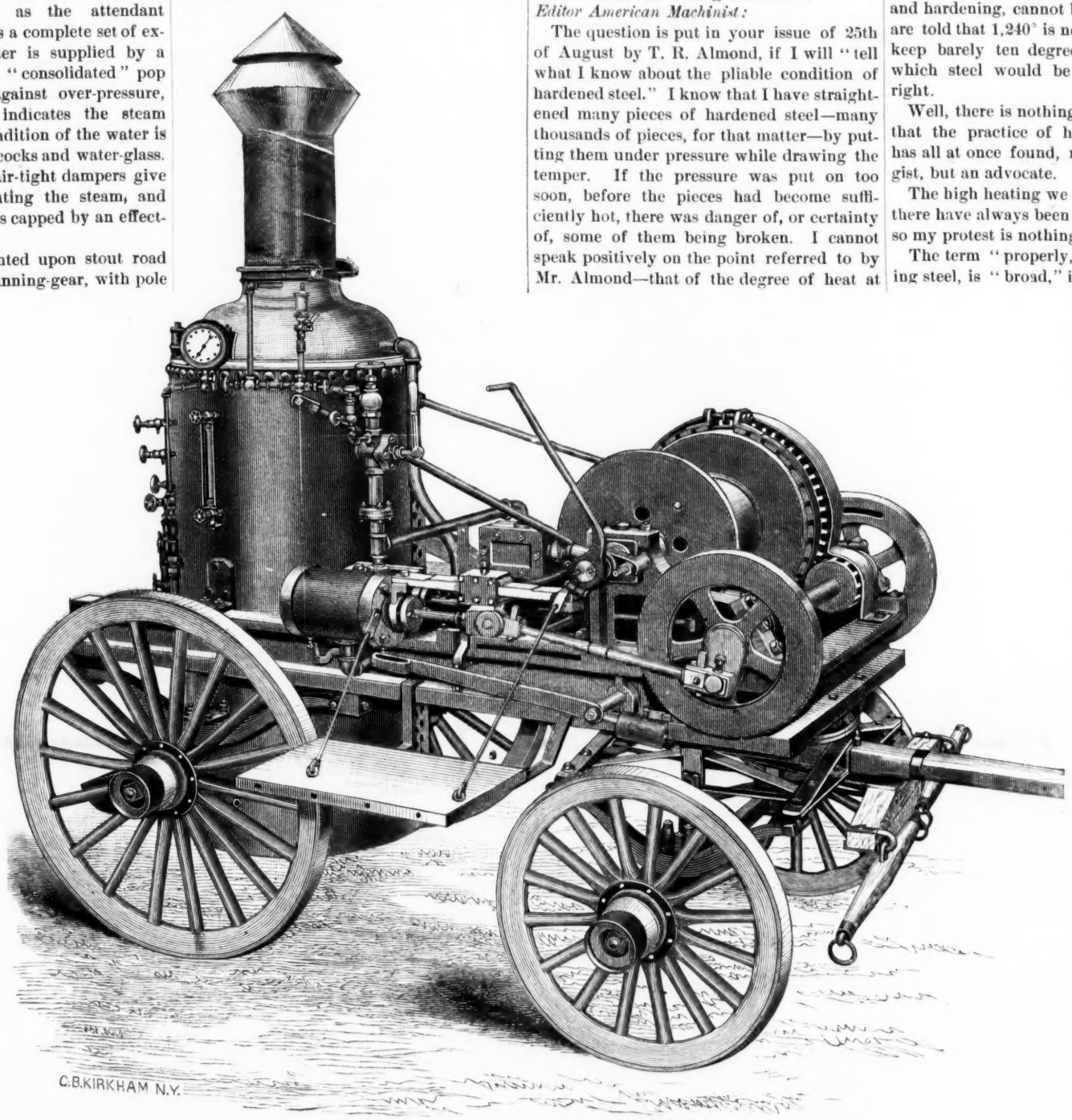
The engines have considerable resemblance to well-known locomotive types. The guides are single, fastened above the line of the piston. A steel cross-head with brass gibs clasp the guide and is rigidly put together. The reversing-gear is the shifting-link operated by two eccentrics. This part of the motion is located inside the end frame, and out of the way. All parts of the machine are easily got at for examination or repairs. Steel is used for pins and other parts subject to heavy strains; brass bushes are fitted to all journals, and neat oil cups furnish means of lubrication.

The portable engine and hoisting-machine illustrated on page 5 is an adaptation of the machine above described to portable purposes. In this machine there is only one friction-drum, but it possesses all the attachments and conveniences for working that have been applied to the larger machine. The frame is elon-

gated to make room for the boiler which is placed in a half-circular bed, the principal part of the weight being supported on stout braces which rest on the frames. A large upright boiler supplies steam, and it seems to have a wide margin of evaporative power.

During half an hour we stood watching one of these engines at work discharging logs from a ship the door was kept constantly open, and a fire of hard coal kept a free head of steam without the aid of a chimney-draft. The exhaust-pipe is arranged so that it can pass into the smoke-stack or direct into the atmosphere as the attendant desires. The boiler has a complete set of excellent fixtures. Water is supplied by a Hancock inspirator, a "consolidated" pop safety-valve provides against over-pressure, and a good gauge indicates the steam pressure, while the condition of the water is made known by gauge-cocks and water-glass. A close ash-pan with air-tight dampers give good means of regulating the steam, and a hinged smoke-stack is capped by an effective spark arrester.

The machine is mounted upon stout road wheels, springs and running-gear, with pole and whiffletrees all ready for moving round from place to place. This peripatetic faculty is found very useful about docks and lumber yards, for the machine can be placed in the most convenient position for doing work just as easily as a common wagon. When the horses are unhitched, chocks are put to the wheels, and the machine is ready to begin work on a new job. Parties using these machines in this city speak in the highest terms of their performance, and especially of their great convenience for handling lumber.



PORTABLE ENGINE AND HOISTING MACHINE.

Making Side Rods.

Solid ended side rods, with the body of the rod formed of I section iron, are becoming very popular for locomotives, and nearly all makers are putting them on their best class of engines. These rods are some what expensive to make and represent more labor than is generally supposed. They are forged solid, the ends and body of the rod having stock sufficient for finishing down. In the Rogers Locomotive Works the plan followed in finishing these side rods is first to ascertain the proper length and drill a hole in the end, which is subsequently bored out the proper size for the brass bushing. The ends are now dressed in a milling machine, and slots are milled in the ends of the rod to begin the channels of the I section. The rod is then put on a planer and the channel cut out between the slots made by the milling cutter. The top, bottom and sides of the rod are also planed off. After this operation is completed the rod is transferred to a bench under a movable emery wheel, where a grinder polishes out the planer marks and leaves the rod ready for emery cloth finishing. This and pressing the brass bushes into their places completes the operation.

A source of considerable loss of heat, in many American locomotives, is the fragile condition of the ordinary run of ash-pans, that do not admit of being closed tightly by the damper-doors. More loss of heat is caused by this than what is generally supposed. We observe that Rogers Locomotive Works are putting boiler-sheet ash-pans on some of the locomotives they are turning out. We commend this plan to the attention of master mechanics.

Edward Weston, of Newark, N. J., the well-known patentee of electrical devices used by the United States Electric Lighting Company, of which he is general superintendent, has just received patents for five new appliances connected with electricity. Two of them are directed to obtaining a more perfect vacuum than has yet been got in lighting globes. One invention is for an electro-magnetic motor, worked on a table or bench in connection with a circular saw or other cutting tool, which revolves on the armature of the motor. The others are an electrical meter and a new dynamo-electric machine.

Hiram S. Maxim, of Brooklyn, has also invented a new electric lamp, which is assigned to the United States Electric Lighting Company.

What Encouraged an Inventor.

Hugo Bilgram, of Philadelphia, invented the bevel-gear cutting machine, which Brehmer Brothers are now making for sale. It works on a new principle for gear cutting, the cutting tool traveling in a straight line. When Mr. Bilgram got his first model finished, he took it to several gentlemen connected with tool making and asked their opinion of his invention. Every one discouraged him. They all considered it never would compete with milling cutters. The inventor concluded they must be right, and he determined to abandon the automatic bevel-gear cutter; so it was laid aside. Some time afterwards, in reading "Extracts from Chordal's Letters," in the AMERICAN MACHINIST, he found Chordal expressing surprise at the rapid work done by the cutter of certain shaping machines. This gave Mr. Bilgram a new impetus, and he concluded there was still hope for his gear cutter, so he went on and finished one of working size. It has proved very successful.

LETTERS FROM PRACTICAL MEN.

Pliable Condition of Hardened Steel—Tool-Dressing Theories.

Editor American Machinist:

The question is put in your issue of 25th of August by T. R. Almond, if I will "tell what I know about the pliable condition of hardened steel." I know that I have straightened many pieces of hardened steel—many thousands of pieces, for that matter—by putting them under pressure while drawing the temper. If the pressure was put on too soon, before the pieces had become sufficiently hot, there was danger of, or certainty of, some of them being broken. I cannot speak positively on the point referred to by Mr. Almond—that of the degree of heat at which there is the greatest degree of pliability—except to say that my experience differed from what he states his to have been. In drawing the temper to a dark straw-color or brown, and sometimes to a purple, I put but little pressure on until the color had changed considerably, and followed up the letting down of temper by putting on additional pressure at intervals until the clamps were screwed home a little before the drawing ceased, either cooling off at once or allowing to cool off under pressure. If these pieces, which were many of them badly sprung by hardening, could have been successfully straightened at as low heat as stated by Mr. Almond, I did not learn that fact; but, on the contrary, supposed that I had learned that an attempt to screw the clamps down solid at such a heat would break a large proportion of the pieces under treatment.

I recollect seeing, when a boy, large numbers of garden hoes and hay forks trued up after hardening, and during the process of drawing the temper, by simply hammering to shape on the anvil, the hammering not ceasing until the temper was sufficiently drawn, and, to the best of my recollection, not commencing until the heat was above that required to produce a straw-color.

Replying to Mr. Gartside's reference to my "side of the question" in his letter contained in your issue of September 8th, I am willing to admit that I am advocating the adoption of an *old plan*. Nor is his *plan* a *new* one. That he should have the "courage to set up" as *the correct theory* that drawn from a terribly bad practice, undoubtedly as old as the use of steel itself, and ask your readers inferentially to consider it a new and valuable "theory," seems strange.

That steel has always been, and continues to be, heated too hot for working, annealing and hardening, cannot be disputed. But we are told that 1,240° is not too hot; that if we keep barely ten degrees below the heat at which steel would be burned, we are all right.

Well, there is nothing *new* in this, except that the practice of heating steel like this has all at once found, not simply an apologist, but an advocate.

The high heating we have always had, and there have always been those who protested, so my protest is nothing new.

The term "properly," as applied to heating steel, is "broad," is it? Proper heating can be done in any kind of fire, because there will be in "the hottest fire a point around the outside where the right temperature is to be had." Can it? "Twelve hundred-pound steam hammer to draw a cold chisel to shape." Of course, the steam hammer can be worked to strike as light a blow as required; but if it was a trip hammer of that weight, the cold chisel would be smashed to hang-nails. That steel can be welded or heated to within ten degrees of the scintillating point, and still, by hardening at the proper heat, prove to be *comparatively good*, has nothing to do with the question at issue. What I had proposed to teach "Jim" to do was to make from a certain bar of steel a tool which would plane a certain steel forging, that had resisted all efforts, up to that time, of the blacksmith to anneal it so that such tools as were already in use in the shop would cut it.

Whether this steel forging might have been annealed by some more skillful blacksmith, has nothing to do with the question. It was hard. My intention was to have it planed. It was planed. The tool with which it was planed was forged at a low-heat to approximate the shape required; was reheated and passed through a second operation of hammering to very nearly the shape and size at which it was to be left; again it was heated and the point cut off shearing, after which came the finishing touches of hammering to true up the blade to the required angle for clearance, and to put the steel in a condition of condensation or compactness. This could not be had by finishing at a high heat. It placed the tool in condition to be returned to the fire and heated carefully to a low-heat for hardening. I did not say that this tool was only heated to a "low-red" for forging, or that three heats were a necessity, nor did I try to describe the heat at which it was hardened. I well remember the retort I got from a blacksmith, who, having been told to heat a certain steel to cherry heat for hardening, and

utterly failing to get good results, had to be set right by a practical illustration. Said he, "Why didn't you say 'black cherry?'"

This tool did not "*crumble*" at the edge. It stood to do all the diamond-point planing on a planer working ten hours per day for several weeks before going back to the tool dresser. It was reground because it got dull by use as the best tool will, *not because the edge crumbled.*

What now are the facts? Tools by the hundred were to be had in this shop which had been forged practically on the plan advocated by Mr. Gartside. I will not impugn the good judgment of the tool dressers by saying that they had been heated so hot in all cases, but am satisfied that some of them were, and still not one of them would cut this hard piece of steel. If the tool I have described stood as I say it did stand, can any conclusion be arrived at other than that of the two plans of tool dressing, that used in the production of this tool was the best?

In conclusion, quoting from the letter under consideration, "How will hardened taps and dies work? How will hardened drills work? Why, they wouldn't work at all; they would break. But, says one, they are different from lathe tools. I say not. They both require a cutting edge." * * * I reply that taps and dies and drills *have been and can be* successfully used without drawing the temper after hardening—if that is what is meant by hardened—and I have no doubt razors may be made to shave in the same way.

Tools "requiring a keen edge" have their temper drawn because it is customary, and because at the high heat at which most of them are worked and hardened, it is a necessity, or the edges would "*crumble.*" But who does not know that the very thing I am sticking for, *i. e.*, the greatest degree of hardness compatible with a sufficient degree of tenacity, will give the best results in a cutting tool from the pocket-knife with which the Yankee whittles to the tools with which Pittsburghers turn chilled rolls? What are the requisite qualities of cutting tools? Tenacity, keenness of edge, durability. Who disputes me when I say that these qualities combined must be had to produce a good tool? Does not the keen edge depend largely upon the fineness of grain of the steel? Does not the durability depend upon hardness largely, as well as upon the fact that the edge is keen, producing little friction in cutting? Is not great tenacity a necessity to prevent the edge from crumbling or the tool from breaking? These three qualities are inseparable in first-class cutting tools. Working and hardening at the right heat produces fineness of grain and a degree of tenacity which enables the tool to be used at a degree of hardness insuring durability unknown to those who harden to brittleness and are obliged to "let the temper way down."

S. W. GOODYEAR.

Elevator Construction.

Editor American Machinist:

I think to your chapters on elevator accidents should be added one on elevator construction. The fault is by no means all in the management of elevators. I have, besides many other machines, charge of an elevator, a crack machine from an Eastern shop. This machine is a continual bother. The screw is so coarse that when the platform is loaded on its up or down trip, and the belt breaks, the pulley brake being off, it comes down at a terrible speed, always breaking some of the belt-shipping arrangement, if nothing serious. There is a brake besides the pulley brake in the form of a stuffing-box around the screw; but if that is screwed up to do any good, the packing burns out within a day.

The driving screw of an elevator ought to be made of such pitch as will not allow the worm gear to drive it.

The pins of the two shipper arms of this machine got loose one time, they only being driven in, when there is plenty of room for set screws, or something else to hold them in place. The belts carried the arms with them, and broke two of the three pulleys.

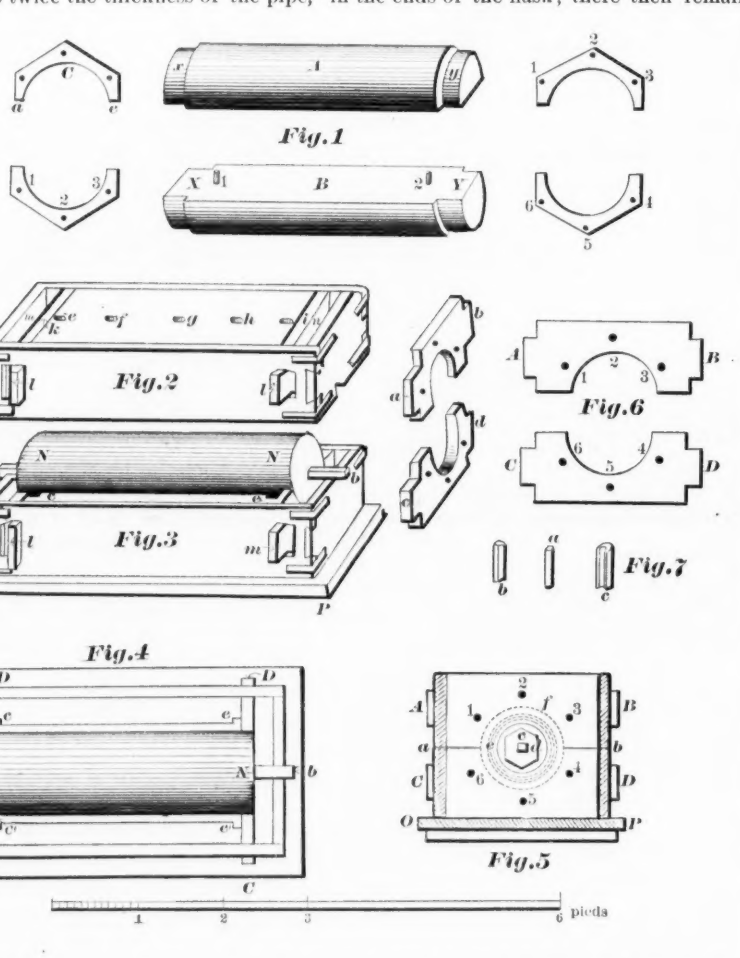
San Francisco, Cal. ELEVATOR.

Moulding a Pipe in 1765.

Editor American Machinist:

I have read with interest the paper of Prof. Sweet, entitled, "A New Method of Casting Flanged Pipe," published in your paper of June 30th, and it recalled to my mind a method of accomplishing the same result (casting the ends of a pipe against a chill so that they are smooth enough to be used with packing) which was in use in France about the middle of the eighteenth century. The following illustrations and descriptive explanation are taken from a work published in Paris "with the approbation and consent of the king," in the year 1765. This detailed account of the method of "moulding a pipe" may seem unnecessarily prolix; but as it is a very good example of the minuteness of many of the early French writers on mechanical subjects, I give the translation without abridgement:

"The accompanying cuts exhibit the manner of moulding a pipe having hexagonal flanges in a 'flask' with 'chill plates.' Fig. 1 represents a pattern of the pipe and its flanges. The pattern of the body of the pipe is composed of two parts *A* and *B*, not including the parts *x*, *y*, and *X*, *Y*, which are the size of the 'core;' the diameter of the body of the pipe is twelve inches, plus twice the thickness of the pipe,



which in this instance is twelve lines, thus the external diameter of the pipe is fourteen inches, and the exterior diameter of the parts *x*, *y*, and *X*, *Y* of the pattern is the same as the diameter of the interior of the pipe, twelve inches. The two parts of the pattern are joined together by means of the pins 1 and 2, in the part *B*. *a*, *C*, *e*; 1, 2, 3; 4, 5, 6, are patterns of the four half flanges, each of which is fifteen lines in thickness, and has a semicircular notch, made to fit the parts *x*, *y*, and *X*, *Y*, close to the body of the pattern.

"The core having been prepared, we proceed with the moulding as follows: On the 'moulding board' is placed one of the 'flasks;' these 'flasks' are formed of planks 1½ inches thick;—their interior dimensions are 20 inches wide—10 inches deep, with a length of about three feet nine; their sides are united by 'dovetails,' which are strengthened by corner 'cramps' of wrought iron; each of the longer sides are pierced by two 'mortices' three inches wide for the reception of the tenons of the 'chill-plates,' Fig. 6; these mortices are distant from one another an amount equal to the length of the pipe including the flanges, which in this instance is 3 feet 2½ inches. Having placed one of the 'flasks' on the moulding board with the side intended to receive the pins of the second 'flask' downward, we take the half *A* of the pattern (Fig. 1) and place it on the moulding board so that the parts *x*, *y* rest in the notches of the 'chill plates,' which they fill exactly; we then take the patterns of the half flanges *a*, *C*, *e*, 1, 2, 3, and place them opposite each other on the ends of the half pattern *A*, in contact with the 'chill plates,' and with their extremities resting upon the 'moulding board;' we then secure the chill plates with wedges which we drive into the mortices, thus forcing the chill plates against the patterns of the half flanges, and these in turn against the pattern of the pipe; then after having dusted coal dust or pounded charcoal on the patterns the 'flask' is ready to receive the sand, which we compress with the 'rammer' and level with the 'striker.' Then we turn this half of the mould up-side-down, and fit to it the second 'flask;' the second half *B* of the pattern, which is provided with pins, also the patterns of the two half flanges 1, 2, 3; 4, 5, 6; dust with coal dust and finish the mould as represented in Fig. 2, with the exception of the parts *m*, *n*, between the 'chill plates' and the ends of the 'flask,' which are left empty: we now pierce with a knife or gouge five holes, *e*, *f*, *g*, *h*, *i*, for 'gates' and 'vents,' the first and last holes are over the flanges, and the three others are over the body of the pipe; these holes at their lower ends are about six lines in diameter; we give both the 'gates' and 'vents' the form of an inverted cone to facilitate the removal of the superfluous metal with which they become filled.

"We now separate the two parts of the mould for the removal of the patterns; this is easily accomplished: having loosened the 'chill plates' we remove first the patterns *A* and *B*, (Fig. 1) and then the patterns of the half flanges; we then place the core *N*, *N*, (Fig. 3) which fits in the semicircular notches of the 'chill plates.' The square ends *a*, *b*, of the 'core mandrel' enter notches made in the ends of the flask; there then remains an empty space between the 'core' *N*, *N* the sand *c*, *e* and the chill plates, similar to the patterns; we then introduce six of the twelve small 'cores' which have already been provided (the method of their manufacture is illustrated by Fig. 7) in the holes of the two chill plates *l*, *m*, (Fig. 3) which plates we previously tighten with the wedges; we then ram sand lightly with the hand in the spaces between the 'chill plates' and the ends of the 'flask' for the purpose of securing the small 'cores' in their holes and preventing the metal from leaking into these spaces; the small cores pass through the spaces which were occupied by the patterns of the half flanges, and rest lightly against the sand which is opposite to their ends; for the purpose of fastening these small 'cores' more securely each of them is provided with a point of wrought iron which serves as a center, this entering the sand and the end of the core being cut off square, their position is assured.

"Fig. 2 shows the upper or second half of the mould in which we placed the 'gates' and 'vents' *e*, *f*, *g*, *h*, *i*; we fill the ends, *m*, *n*, of this 'flask' with sand after having introduced and placed the small 'cores' in this half of the mould; *lk*, *li*, are the "chill plates" which support the small 'cores.'

"In this and the preceding figure we have omitted the wedges which confine the tenons of the 'chill plates,' to enable the mortises in the two parts of the flask to be better seen; these two parts, when fitted together, compose the mould, and are then ready to receive the melted iron.

"Fig. 6 shows the cast iron chill plates of which we have spoken, in plan and perspective, *A*, *B* being the 'chill plate' for the upper, and *C*, *D* that for the lower flask; the semicircular notches are made to fit exactly the 'core.' The holes, 1, 2, 3, 4, 5, 6, are for the purpose of supporting the small 'cores,' which serve to make the bolt-holes in the flanges of the pipe.

"Fig. 4 is a plan of the 'flask' shown in Fig. 3 (it being the lower half of the flask) placed upon the moulding board; *a*, *b*, mandrel of wrought iron, on which the core is made; *c*, *e*, the space in which the metal is run for forming the body of the pipe; c^1, e^1, the space traversed by the small 'cores,' in which the metal forms the flanges. *C*, *D*, the 'chill plates' in which the small cores are held.

"Fig. 5 is a transverse section of the mould taken through the part exterior to the 'chill plates;' *a*, *b*, the line of separation of the two 'flasks,' or parts of the mould; *O*, *P*, moulding board; *C*, *D*, 'chill plate' of the lower 'flask;' *A*, *B*, 'chill plate' of the upper 'flask;' *c*, wrought-iron mandrel for the 'core center;' *d*, *e*, the 'straw rope' which surrounds the 'core center;' *f*, the 'loam' which surrounds the 'straw rope;' 1, 2, 3, 4, 5, 6, the six holes in the 'chill plates,' which receive and support the small 'cores.' For forming the small cores we employ two half cylinders of wood, *b*, *c* (Fig. 7), grooved through their whole length, the two parts of this hollow cylindrical mould being united and powdered with coal dust; and having mixed clay of a suitable quality with horse dung, we fill the mould with the aid of a 'rammer,' and press in the 'loam,' so that the 'core' has a proper consistency. We then separate the two 'shells,' or halves of the mould, and we have the small core *a*, which we allow to dry in the shade. We make a great number of these small cores, which we preserve for use in the pipe moulds."

In the work from which the above was taken there are several modifications of the foregoing described method of casting pipe, adapting it to the case of pipes having flanges placed at an angle, and to pipes having one or more flanged branches.

In casting pipes by the foregoing, or any similar method, it is advisable to employ an iron having but slight tendency to "chill," in order to secure the strongest possible flanges; for if a metal is used that has a disposition to "chill" deep, the junction of the flange with the body of the pipe will be weak and might cause trouble.

W. F. DURFEE.

Bridgeport, Conn.

Mending a Rroken Crank.

Editor American Machinist:

I believe a good many readers of your paper were interested in the articles by Prof. Sweet and by R. H. on fitting up center crank shafts, because the making of a reasonably perfect built-up crank is one of the best jobs connected with steam-engine building. Prof. Sweet clearly shows the means he employs to arrive at correct results, and they seem to be good and novel; but R. H. leaves his crank without a pin, and when putting in the pin is the last thing done there is considerable chance for error.

As both these correspondents describe making new work with reasonably good—perhaps the best—facilities, I have thought the annexed plan of mending a broken crank shaft, an operation that involved the employment of correct processes with improvised means, might be of interest.

This crank shaft, which is shown to a scale of $\frac{3}{4}'' = 1$ foot in Fig. 1, was a new one, breaking within two weeks from the time the engine was started. The cranks were turned and planed all over. The break is indicated at *a*, and had every appearance of an imperfect weld; but as the throw was cut out of solid metal, of course there was no intentional weld there. Getting a new shaft would involve a loss of three weeks' time, and sending the shaft where it was made for repairs was open to substantially the same objection. The largest available lathe within fifty miles was a weak 20″ swing, but in the shop with this lathe was a large old-time planer and a good drill press; so it was determined to do the job—that is, bore out the cranks and put in a crank pin—at home.

The two ends were put on the planer, and the projecting pieces of the crank pin were planed off as well as they could be conveniently. (The faces of the cranks would have been squared off true with the ends of the shaft if there had been a lathe at hand that would swing them.) The holes for the crank

pin were then laid out, and drilled and bored under the upright drill to within $\frac{3}{16}$″ of the full size of the pin, which was 6″. The inner faces of the cranks were brought together and strapped as in Fig. 2. The planer centers were then blocked up on the planer bed, the shaft mounted between them, and, after counter-balancing, revolved. As was expected, the shaft did not run true, and it required considerable perseverance in shimming between the faces of the cranks to get it satisfactory in this respect when firmly strapped together. When this was accomplished the centers were removed, the saddles or V's, *b*, substituted, and the shaft mounted for boring, as shown.

For a boring bar a piece of 3″ hot polished shafting that happened to be at hand was used. This was babbitted to a pair of boxes *c*, which whatever else they were designed for were not made for this job. The babbitting was done with the boxes bolted in place—presumably the right place—on the planer table, but when they were scraped to the shaft they required adjusting slightly. The bar was set by means of a surface gauge, and by gauging with a wire the distance between the bar and the shaft. The shaft was clamped in the saddle and the cranks clamped to the parallel piece *d*. The bar was driven by a pulley on it, and a belt from a pulley on a shaft in a convenient 16″ lathe. The feeding was done by the screw *e*, tapped through an angle plate.

The holes for the pin were bored full size, that is, so as to require no shoulder on the pin. After boring, the two ends of the crank were slid in opposite directions so as to just admit a block as thick as the crank pin bearing was long, between them. The two ends were then removed to the fire and the cranks slowly heated together, as nearly alike in all respects as it was possible to heat them, then brought back and put in place on the saddles with the outer ends resting on the piece *d*, and a block, previously fitted, under the inner ends in line with the shaft. The pin was then slipped through from one side, the ends of the pin coming just even with the outside of the cranks. The clamps were tightened moderately on the shaft, and a shim of the proper thickness placed between the pin and the piece *d*, the clamp put on the pin and the whole left to cool. After cooling, wrought iron bands made of iron 1″×4″ were shrunk on each crank, both bands being heated and shrunk on at the same time.

The reason for special pains in heating the cranks alike, as well as for putting the bands on at the same time was, because it was believed to be essential to keep the cranks at all times after the pin was in place of substantially the same temperature, and hence, presumably, of the same length.

After it was cool the shaft was again put on the centers and without much figuring upon the amount of the "resultant error," it was pronounced "good."

It may be remarked that had the ends of the shaft been found out of truth it was the intention to try and remedy the fault by upsetting the ends of the pin in the holes. Whether this plan would have succeeded is still an unsolved problem.

The finishing job was to put a $\frac{7}{8}$″ steel pin through the band, crank and crank pin on the long or driving end of the shaft, and put the shaft in place, where it is doing duty altogether satisfactorily. The crank pin was made of hammered iron, mainly for the reason that iron was at hand and steel was not. The allowance for shrinkage was, as nearly as could be measured, $\frac{18}{1000}$ inch.

I do not believe a pin put in rough cranks in this way would be as likely to make a good job, because the metal around the pin on the thin sides would be likely to vary in thickness, lengthwise of the holes, and hence would yield unequally in shrinking against the pin. I also believe that it is important that the shrinkage be equal the whole length of the fits; in other words, that the holes and the pin be accurately straight or uniformly and equally tapered, and that too much care cannot be exercised in heating the cranks very evenly and alike, and not too hot. As a rule I am not particularly prejudiced in favor of shrink fits, but my experience has been that it is not practicable to make as good job of mending a broken crank by pressing the cranks on the pin as it is by shrinking them together. Mistakes are made in the matter of shrink fits by too large an allowance for shrinking, which makes it necessary to heat the parts hotter than they should be heated, and strains the parts out of truth. When it is required that the parts shall come true after shrinking, as much pains should be taken with the fit as if the parts were to be driven, pressed or screwed together.

FRANK GLEASON.

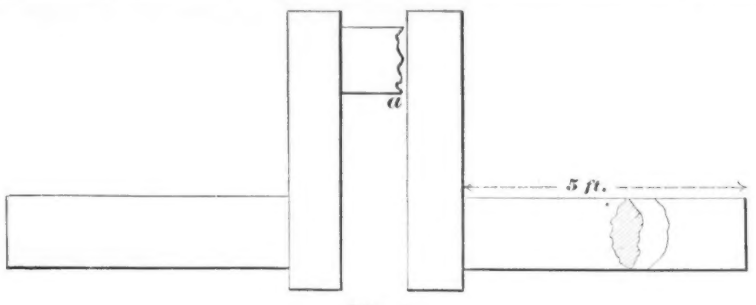


Fig. 1

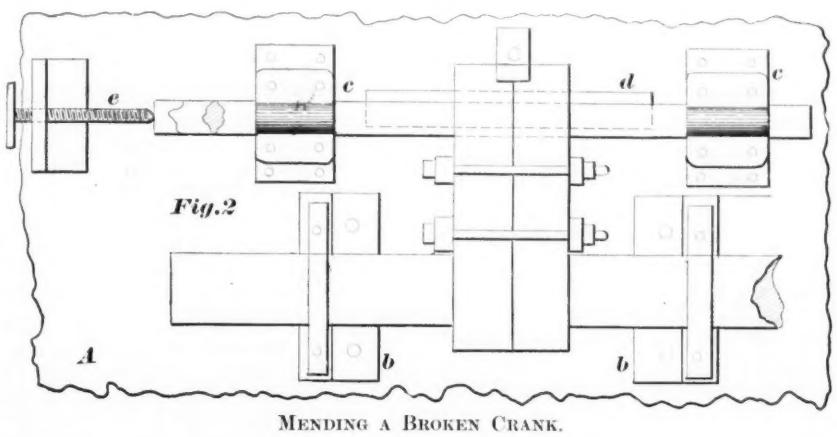


Fig. 2

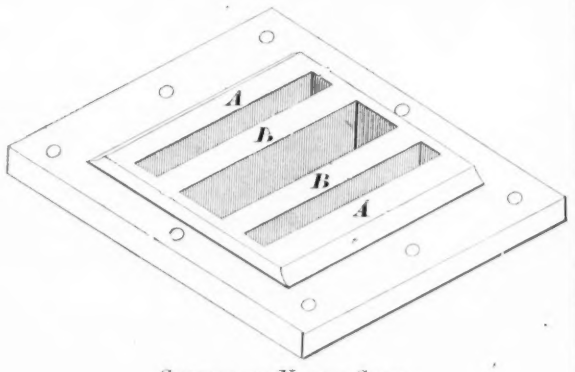
MENDING A BROKEN CRANK.

Valve-Seats Wearing Hollow.

Editor American Machinist:

In your issue of September 8 appears an inquiry as to what causes valve-seats to wear hollow.

As I have been observing this for some 15 years, and have made a few experiments, my conclusions may be worth something. While I recognize the fact that in link engines, hooking up and working the valves short-stroke will throw the wear most heavily on the center, yet that is not the only nor the greatest cause of hollow seats. Two of the worst cases I call to my mind now were stationary engines, worked full-stroke constantly; one of which when repaired, the owner in his frenzy to get something to stand the wear, actually wanted a steel seat put on. Think of that!



SKETCH OF VALVE SEAT.

During my experience I have noted one fault, as I claim it to be, in valve-seats, and our best locomotive builders constantly allow it, and the average master mechanic thinks it has to be that way. I send a sketch of a valve-seat as I believe best adapted to stand this wear.

The two outside bearings, *A*, *A*, are each the same width as the bridges, *B*, *B*. When made this way they will wear reasonably straight. Locomotives usually have bridges 1″ wide, and the outer bearing from 1½″ to 2½″. I remember one 3″ which I found $\frac{5}{16}$″ hollow after eight months' service on freight; and another—an 8x14″ stationary—had the seat planed just to fit the steam-chest, and I found it $\frac{3}{8}$ hollow, yet smooth as glass. Kind of a rotary valve wasn't it? It was in a machine shop, too.

I am aware that this manner of planing a seat may be objected to, but it can be defended successfully.

FERRUM

The Monkey-Wrench Endorsed.

Editor American Machinist:

Chordal's remarks on the monkey-wrench provoked discussion in our shop. Our lathesmen all heartily concur with Chordal, and consider a good monkey-wrench an indispensable tool to any machinist's tool-chest; and further, any machinist that would consider a monkey-wrench "an abomination" around a lathe, or even a planer, we would consider an abomination to any shop. Don't abuse the monkey wrench, but give it a fair show, and *use* it is our motto.

ALTOONA.

The Principle of the Injector's Action.

Editor American Machinist:

In your issue of August 18th Mr. Sinclair, in an article on injectors, explains the principles of their action, as he calls it, and points out analogies where currents are induced.

These analogies, none of them relate to conditions where the induced matter is subject to an opposing pressure equal to the inducing one, and I fear the "principle of action" is not so explained as to come within the scope of ordinary understanding.

All that is said, so far as can be seen, relates results or sequences, the principle being passed over.

Induction means the over-running of the propelling current, and the friction or traction, so to speak, of a steam current dragging water into a boiler against a pressure equal to that upon the steam current will scarcely do.

If I am not wrong, Mr. Giffard understood perfectly the principle upon which his injector operated, and with others has explained the same in various instances.

I think if Mr. Sinclair will supplement his description of the principle upon which injectors act, taking into account the velocities and density of steam and water, he will find himself more nearly in accord with other authorities on the subject, and that the water is not inducted but driven in accordance with a very simple law.

I think, also, that there is not in practical use any other operation corresponding to the steam feed injector of Giffard; in fact, steam and water are the only elements where such action would be possible.

J. RICHARDS.

San Francisco, August 18, 1883.

A Time-Keeping Plan that Works Well.

Editor American Machinist:

We are constant readers of your valuable paper, and have been watching for something in the way of time-keeping cards that would be better for small shops than our own.

Enclosed find one of ours. We could not make the men fill them out properly until we made it for their interest to do so by using the card to get the time for pay-roll. This system is not perfect, but with the amount of watching it takes to make anything go, it works well for us.

SIBLEY & WARE.

South Bend, Ind.

TIME SHEET FOR PAY ROLL.

State plainly who the work is for and the exact time on each job, and be careful to note all material used, so that we will make no mistakes in charging our customers or cheat ourselves.

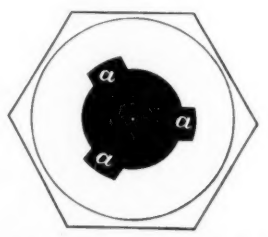
SIBLEY & WARE.

Whose Work.	Stock Used.	Remarks.	Hours.

Date.....188

Total No. Hours for which I expect pay.....

Name of Workman.....



Novel Thread Cleaner.

Editor American Machinist:

I have read your truly valuable paper for the past three years, and have always found therein much useful information, especially in letters from practical men.

I would like to say a word to my brother engineers, as it may help some who are troubled the way I was. About eighteen months ago I went to take charge of an engine of the George H. Corliss type, the cylinder being 20x48″, taking steam from two Corliss upright boilers.

Things looked as though they had received pretty good care in former days, but when I came to pack the valve-stems of the engine I found an obstruction. The threads on the stuffing-box bolts were so gummed up with oil that it was with the greatest difficulty that the nuts could be taken off.

I tried several ways to clean them, without success, and at last hit upon this plan: I took an old nut and tapped it out the same size of the bolts and with a small square file slotted it as in the figure at *a*, removing about ½ or ⅓ of the thread. I did not bush it off as I should in making a solid die.

After slotting I case-hardened it by the directions in the AMERICAN MACHINIST of Jan. 1, 1881. Then it was complete. I oiled the bolt well and screwed this nut on until it brought up against the other nut, then removed it, and to my delight found I could remove the nut with my fingers.

I think this a much better way than it is to try and take the bolts out, running the risk of breaking them.

PACKING.

The boilers of the steamer Riverdale are out of the river, and the mystery of that explosion is elucidated. The initial rupture took place in the bottom of the boiler near the forward end, and nearly all the bottom sheets were torn into strips. What appeared to be the cause of the accident was a rupture about two feet long, where the edges of the torn boiler sheet were not ⅛ of an inch thick. All round this spot for an extent of two or three feet the sheet was very thin, and had been worn away by corrosion. One seam that stripped through the rivet-holes also showed serious evidence of corrosion.

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NEW YORK, SEPTEMBER 22, 1883.

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Government Steamboat Boiler Inspection.

As usual upon similar occurrences, the failure of one of the boilers of the steamboat *Riverdale* is made the occasion for sweeping condemnation of Government inspection. There are undoubtedly lessons to be learned from this disaster, but they will never be learned if all the energy of reformers is expended in the attempt to fasten the entire responsibility on the system of inspection. It may be shown that inspection is not always—perhaps was not in this instance—as thorough as it ought to be, but this is no apology for the explosion of a boiler, nor hardly an argument against inspection. According to present information, the boilers of the *Riverdale* were inspected last June—about three months previous to the failure of one of them—from which it is assumed that the inspection must have been defective. Had the explosion occurred six or nine months later the assumption would have been the same, and quite likely wrong in either case.

A certificate of inspection amounts to an official sanction of the condition of a boiler at the time the examination is made, and permits its use in that condition for a specified time. But it supposes the employment of skilled engineers, held to a reasonable accountability in the discharge of their duties, and afforded needed opportunities to look after the safety of the machinery they handle. Government supervision also offers some assistance in the selection of engineers, but it is just as impossible that it shall pass upon all the necessary qualifications of an engineer as it is for it to provide that a boiler shall be kept in a safe condition for any length of time after examination.

The weak place in the present system of Government boiler inspection is that it induces a feeling of false security; a shifting of the responsibility and a relaxation on the part of owners of the precautions that would otherwise be taken. Further than this, it is undoubtedly sometimes taken advantage of by selfish and unprincipled owners to continue risks they know should not be taken, because in the event of disaster the blame may appear to rest otherwheres than with them. And in this the public are generally willing to assist by laying all the blame to the inspector, as if he could give some sort of a guarantee that a boiler should not, by abuse or otherwise, be got into a dangerous condition within a certain time.

A careful and competent engineer can and will know, all the time, as much about the condition of boilers he has the care of as any Government inspector is likely to find out once a year; that is, he will if he is given the opportunities to make the necessary frequent examinations; but there is always the danger that careful and competent engineers are not employed, or that they are not given the necessary opportunities for close examinations of boilers.

The stumbling block in the way of Government inspection is the manner in which it is looked at, the impossibilities that are expected of it; that is, that instead of being something with which the owners of steam vessels should co-operate in inducing safety, it is assumed to be something that should effect safety in spite of a lack of co-operation. Perhaps inspection needs reforming, and if so, it should by all means be reformed; but the cause of boiler explosions will have to be looked for elsewhere. If it is to be relied upon that inspection shall insure safety, at least two inspectors will be required for every boat that runs regularly.

There is another unfortunate feature connected with the running of excursion boats, especially in the vicinity of large cities, where the number of passengers carried during the warm months is enormous and the responsibility correspondingly great. That is the facility with which their names are changed. Bad management—conveniently called bad luck—may lead the public to distrust and shun a boat, or old age may have set its mark too heavily upon it, but a coat of paint and a new name sometimes cover a multitude of sins.

Reports have been spread that the business of building stationary engines has become quite dull. These reports are not true. On the contrary, the leading engine-builders, both East and West, are, as a rule, well supplied with orders, and their shops are quite busy.

The largest and strongest trade organization of workmen in this country is the Amalgamated Association of Iron and Steel Workers. They fully recognize the principle of protection to American manufactures, and have lately refused to fraternize with a labor union that advocates free-trade. There are several small labor unions with high-sounding names that seem to exist for no other purpose than to come out with declarations in favor of free-trade, or of certain political candidates, when the wide-spread publication of such action is expected to influence independent workmen. There is no labor union of any special consequence in this country that, as a body, advocates free-trade. Foreign manufacturers and their representatives and apologists in the United States are making great efforts to use workmen to pull their free-trade chestnuts out of the fire. If those who consent to be thus used accomplish anything in that direction, they are pretty sure to get burned.

Free Trade Banqueting.

The Sachems of free trade in England are the members of the Cobden Club, an organization that is filled and supported by parties interested in extending British trade and commerce. The Cobden Club has been laboring zealously for many years to convert all nations to the views that tend directly to bring money into the pockets of the members. They have scattered hundreds of tons of free trade literature where it would do the most good; they have lobbied legislatures and suborned newspapers in their proselyting ardor. The most intelligent people all over the world are getting to perceive that Britain alone is the gainer in every extension of free trade policy. Home journals throw ridicule and scorn upon the pretensions and actions of the Cobden Club, but that body still persists in striving to make free ports for British manufactures, and America seems to be the object of their greatest solicitude. If they can only prevail on the United States to paralyze the business of Pittsburgh that Sheffield and Manchester may flourish, the Cobden Club will be happy.

Following the custom so dear to Englishmen the Cobden Club has a stupendous feed once a year, when, amidst wine-colored sentiments, they proclaim to the world what they are doing to further British interests. When they can ensnare any foreigners to corroborate their work, the annual dinner of the Cobden Club is a success; when they get Americans to assure the diners that free trade sentiments are spreading through the States, the club feels regenerated. They were made unusually happy this year by catching two very large American gudgeons, who gave them comfortable assurance that the American market would soon be opened for unrestrained competition. Horace White asserted that free trade had made much progress lately in the United States, and Thomas G. Sherman considered the prospects of free trade in America very bright. Sentiments of that kind may be very gratifying to Englishmen, but they will have to wait a long time before the popular voice of America makes free trade a possibility.

Sometimes workmen who are not satisfied with the wages they receive or the conditions under which they are asked to work, unite in a body, put their savings into a pool, and use up the whole in efforts to freeze the employers into granting more wages or into making some other concession. Sometimes, however, a few workmen, when dissatisfied with their situations, discover that they can pool their savings and start business on their own account with fair prospects of success. The following is an example which we find recorded in the *Syracuse Evening Herald:*

"When the piano-key makers returned to work after their ineffectual strike lately, five of them found themselves left out in the cold. Seeing no prospect of obtaining employment, they pooled their savings and went into business on their own account. The venture has proved a complete success." We know not how long the strike lasted, but it is safe to say that the piano-key makers would now be in better financial circumstances had they decided upon starting a factory of their own immediately after leaving their old employers, instead of idly waiting for the latter to yield.

Literary Notes.

THE COMPOUND BOILER; HOW TO USE IT AND Run it at Sea; Explaining Causes of all Corrosion and the Formation of Scale, with Instructions for its Entire Prevention, together with Useful Information for Maintaining Steam at Sea. By a Sea-Going Engineer. E. & F. Spon, 35 Murray street, New York. Forty cents.

The author of this pamphlet has devoted close attention to the subject of steam boilers, and his observations are taken from the standpoint of a practical marine engineer. What he has learned about the behavior of boilers under varied circumstances is related in a clear, common-sense manner, that will appeal in a plain way to the men needing the information. The compound boiler is the subject specially treated, but the remarks on the most important points apply with equal force to other common forms. This is especially the case respecting corrosion, pitting, and the formation of scale. The work is illustrated with several diagrams which are successfully used to elucidate the text. Seagoing engineers will find this small book a valuable addition to their library; and if its contents are well digested, the knowledge gained will tend to prolong the age of boilers besides saving the contents of the coal bunkers.

THE DISPOSAL OF SEWAGE IN SUBURBAN Residences. By Edward S. Philbrick, C. E. The Sanitary Engineer, 140 William street, New York. Price 30 cents.

This pamphlet is published to give information to property owners respecting a cheap method of disposing of house sewage, by running it into the soil of adjoining lands. One important item of cost hitherto experienced, in applying drainage in this way, has been the expense of surveying the ground. The explanations given in this pamphlet are intended to enable an ordinary stone mason to execute the work according to levels taken by himself, by the ordinary tools of his trade. The leading details of the plan are made plain by sketches of the work.

PAINTING AND PAINTERS' MATERIALS: A book of Facts for Painters and those who use or deal in Paint Materials. Treating of Oils in all their various relations to Paint and Colors; of Pigments, their qualities, uses, changes, adulterations, and tests; Varnishes, their materials, comparative qualities, uses in decoration, and their mysteries and changes in use; of Driers, and their effect in the drying of paint and varnish; of Wood and Iron as Preserved by Paint, and their relation to cracking and peeling of paint and varnish; of the Management of Paint Shops, carriage painting and car painting; of Decoration and the use of Color, and of the Effect of Paint on Health. By Charles L. Condit. Railroad Gazette, 73 Broadway, New York.

This book covers a wide field in treating of a most difficult subject. The author appears to be quite equal to the task he has undertaken, for the hand and head of a master are indicated by his familiar treatment of the numerous practical manipulations of the paint shop. Difficult questions, involving profound original scientific investigation, are elucidated in a manner that shows the author of the work to be as much at home in the laboratory as he is in the paint shop.

Like most practical men, Mr. Condit discriminates clearly between the value of practical and theoretical instruction. He plainly intimates that skill in painting will not come by reading books. That must be obtained by practice in the work. But the philosophy of the business will not be acquired in the shop, and the man who wishes to obtain insight into the theoretical branches of his art must appeal to text-books for information. Besides the facts drawn from the experience and experiments of himself and coadjutors, the author collates from all the best-known authorities on painting and painters' material till the work may be regarded as a digest of

all the important discoveries made in this line. We commend the book to every painter whose ambition rises above the mere mechanical use of the brush. With master painters it is likely to become a recognized handbook.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

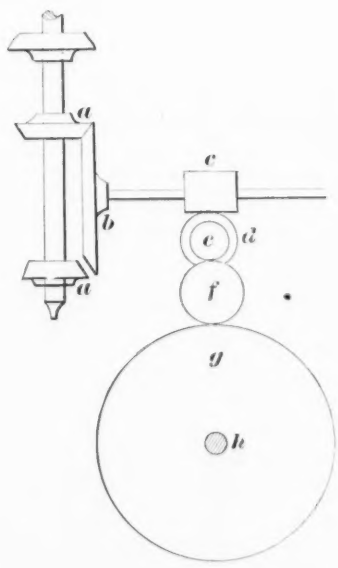
(303) A. C., Chelsea, Mass., asks: 1. Will you give me a rule for finding the horse-power of a boiler? *A.*—There is no rule applicable. 2. Will you please explain the operation of a hydraulic governor? *A.*—See description in the AMERICAN MACHINIST of May 21, 1881.

(304) C. H., Hudson, Mass., writes: I have a feed-pipe so arranged that I can pump either into two boilers at the same time or into either separately. If the pressure is equal in both boilers, what will be the difference in pressure against which the pump works between pumping into one or both boilers? *A.*—If the pump is run at the same speed in both instances, there will be no difference.

(305) C. H. Hamilton, Ontario, says: In an old recipe book I came across the word oxy-muriatic acid. What is its modern name? I have a friend who says that it is chlorine. Is he correct? If not, what is its formula? *A.*—When chlorine was discovered by the chemist Scheele, it was called dephlogisticated muriatic acid, but the French chemists called it oxy-muriatic acid. That is probably where the recipe-book got the word. It meant chlorine, whose symbol is Cl.

(306) G. B., Pittsburgh, Pa, asks: Is a steam pipe covered with non-conducting material hotter than one not covered? *A.*—The outside of the pipe would be warmer than if exposed to cold air. There would not, under ordinary circumstances be any material difference in the temperature of the inside, but if any, the covered pipe would be the hottest 2. If pieces of iron are fastened inside a steam pipe, will they, by friction, become hotter than the steam that passes through the pipe? *A.*—No.

(307) J. R., Glen Rock, Pa., writes: I inclose you rough sketch of governor attachment of a 17-foot overshot water-wheel, and want to ask if it can be arranged to operate the gate quicker. We have tried several plans, and the one shown is the only one that seems to answer at all, and this one is too slow. *A.*—The arrangement may be represented by the diagram in which *a*, *a* are bevel wheels of 24 teeth each, *b* a wheel of 48 teeth, *c* a worm ¾″ pitch, *d* a worm wheel of 52 teeth, *e* a spur pinion of 16 teeth gearing by means of the intermediate wheel *f* with the spur *g*, which has 88 teeth. On the other end of the shaft *h* (upon which is the 88-toothed wheel), is a wheel of 14 teeth, working in the rack of the gate. The upright shaft runs at 52 revolutions per minute. Without an inspection it would be impossible to say what should be done. If it is only a question of increasing the speed with which the gate is hoisted, there are several ways that suggest themselves. You can, for instance, put the wheel *f* in place of wheel *g*, using the latter as the intermediate wheel, which, although the size of *f* is not given, we should assume by the sketch would make the motion two or three times as rapid. Still greater speed could be had by changing places with wheels *e* and *g*.



(308) J. C. Sherbrooke, Canada, says: 1. I am building a machine for boring out cylinders, and am puzzled about what sort of a drill to use in boring a hole in a 3″ shaft. The hole will require to be about 36″ long, 1″ diameter, and perfectly true. Can you help me out? *A.*—It is extremely difficult to bore such a hole true. We should try it by first boring with a ⅞″ twist drill, then follow it with 1″ twist drill, ground quite flat on the end. 2. Where can I find good directions for setting the valves of a locomotive? *A.*—In the AMERICAN MACHINIST of September 2, 1882. 3. We are using some of Krupp spring steel, and it don't seem to stand after it is put in the springs, after they are set and tempered. In a few trips they have to be taken out and set again, more especially engine truck springs. Now, I would like to get a remedy for this. *A.*—The best method of success we have met with in tempering locomotive springs was by tempering in oil, blazing off, and having a first-class blacksmith managing the operation.

(309) W. C. B., New York, writes: I am running a locomotive 9x14 with 40″ driving wheel. She has got ¼″ lead on back end and 3-16″ on front end. Very often I have to take the slack to start two cars. What I want to know is, if I alter the eccentrics and give only 1-16 lead, won't that give me more inside lap on the exhaust, and would it make the engine any smarter? *A.*—The engine has certainly too much lead. For that size of engine 1-32″ ought to be enough in full gear. The engine will be smarter and do her work better with less lead, if the motion is all right otherwise. Changing the lead does not alter the lap. 2. Would it be better to cut the inside lap out of the valve and give just 1-16 lap outside? Do you think she would do better work that way? *A.*—We would not advise you to cut out the inside lap. That would have a tendency to make the engine smarter, but it would be harder on coal, and she would not hang so well to a train on a hill. 3. What size of nozzle would you advise me to use? *A.*—Just as large as possible, consistent with making steam. 4. The engine is ten tons weight and carries one hundred and twenty pounds steam pressure. How many cars ought she to take up a hill eighty feet to the mile? *A.*—About a load of fifty tons at a speed of ten miles an hour, working full gear. 5. When the engine is on the quarter she lacks 3-16 of having full port opening. Should she not have a full port opening in that position? *A.*—The engine ought to have a full port opening in that position when the reverse lever is down.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

F. VanWinkle, Mech. Engin'r, 22 Cortlandt st., N. Y.

James W. See, Consulting Engineer, Hamilton, O.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Presses & Dies, Ferracute Mach. Co., Bridgeton, N.J.

For Sale—Stamp figures, $1 per set. S. M. York, Cleveland, Ohio.

The latest Improved Match Machinery is made by the White Machine Co., Waterbury, Conn.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Consulting Engineer and Mechanical expert, C. C. Hill, 144 LaSalle street, Chicago, Ill.

Chas. T. Porter, Mechanical Engineer, Tribune Building, (Room 42,) New York City.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

For sale, 25″ lathes of best designs from new patterns. George A. Ohl & Co., E. Newark, N. J.

Patents.—Franck D. Johns, Att'y at Law & Solicitor of Patents, 617 Seventh St, Washington, D. C.

Lyman's Gear Chart How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Wood Engraving done in best manner. Designs furnished. Edward Sears, 48 Beekman St. New York

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

How to reach 40,000 prominent "*Steam Users*" in the United States. Send for our circular. The J. N. Mills Publishing Co., 145 Broadway, N. Y.

William J. Baldwin, consulting engineer in Steam Heating and Ventilation. Author of "Steam Heating for Buildings." Office, 96 Fulton st., New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N Y. Steam Pumping Machinery of every description. Send for catalogue.

Young men wishing to take a mechanical course or learn the machinist's trade, call or address School of Mechanical Instruction, No. 195 Front street, Worcester, Mass.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant. $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

BOUND VOLUMES of the AMERICAN MACHINIST for 1880, 1881, and 1882. A limited number of each sent by express for $4 per volume, express charges to be paid by purchaser. AMER. MACHINIST Publishing Co., 96 Fulton st., New York.

Business men furnished stenographers, who are machine operators, without charge for my services. Shorthand taught by mail. Caligraphs sold; special inducements offered; correspondence solicited. W. G. Chaffee, Oswego, N. Y.

Wanted—Correspondence with engine builders, boiler makers, and supply dealers in steam goods. We manufacture the *cheapest* Injectors and best Steam Jet Pumps in this country, and offer to *live men* the most liberal terms ever named. Drop postal for particulars to J. B. Sheriff, Son & Co., 68 Water St., Pittsburg, Pa.

"HOW TO KEEP BOILERS CLEAN."—A book of seventy-two pages, telling how to prevent scaling, foaming, priming, and burning, with other valuable information, will be sent to any address FREE of postage, by James F. Hotchkiss, 86 John street, New York.

We will pay 25c. each for copies of January 1st and 8th, 1881. They must be clean and in good condition. Any of our readers who are kind enough to send either of the above dates, will please write their name and address on the wrapper. AMERICAN MACHINIST Publishing Company, 96 Fulton street, N. Y.

Chordal's Letters.—John Wiley & Sons, 15 Astor Place, New York, have now ready a new and enlarged edition, with six additional plates, of Chordal's Letters, comprising the choicest selections from the series of articles entitled "Extracts from Chordal's Letters," which have appeared in the columns of the AMERICAN MACHINIST; with a steel portrait of the author, and upwards of fifty original illustrations by Chas. J. Taylor. One volume 12 mo. of nearly 400 pages, cloth, $2.00. Will be mailed and prepaid on the receipt of the price.

Credits.—Ealy's "Blue Book," July, 1883, just published, contains a complete classified list of over 100,000 names of machinists and dealers in machinery, railway machinists, engine and boiler makers' supplies, brass goods, metal, etc., in United States and Canada. The book is condensed making it much more convenient to handle than a larger agency book. It gives the financial standing and paying qualities of all dealers and manufacturers in the above-mentioned lines of trade. For terms, etc., address The John W. Ealy Company, 51 Chambers street, New York, or 79 Dearborn st., Chicago, Ill.

MANUFACTURES.

Scannell & Whalley, Lowell, Mass., expect to have their new boiler shop ready by October 1.

The Keystone Manufacturing Company, Sterling, Ill., are building an addition to their foundry, 50x60 feet in area.

Negotiations are going on for the Denver Exposition buildings, to be used in the future as a manufacturing establishment.

The Ogle County Manufacturing Company is building a new factory at Oregon, Ill., for the manufacture of wood-seat chairs.

The people of Henderson, Ky., have raised $200,000 for a cotton factory, and people in the East have furnished a further sum of $100,000.

The Parsons Paper Company of Holyoke, Mass., are just about beginning the remodeling of their mills. The cost will be from $50,000 to $75,000.

The Magee Furnace Company, Chelsea, Mass., are constructing a six-story building, 66x100 feet, to be used as a stove-mounting shop and for storage.

The works of Batcheller & Son, manufacturers of agricultural implements, Rock Falls, Ills., are being enlarged by the erection of a new foundry building.

W. P Davis, North Bloomfield, N. Y., manufacturer of key-seating machines and drill-presses, writes us: Trade is picking up fast with us again.

Wilson & Esmay are building a factory at 327 South Canal street, Chicago. It is to be 44x50 feet and five stories high. The building will be done by November.

The new gun factory of the Davenport Arms Co., East Douglas, Mass., will, at the outset, be a building 30 by 100 feet, two stories high, and will employ 25 or 30 hands.

The Nicholson File Company, Providence, R. I., are building an addition, 80x40 feet, two stories, for the manufacture of the finest grades of files for jewelers' use.

The machinery business looks much better than it did a month ago. Shops are getting more orders and are putting on more force of workmen. This is the case both East and West.

The steel works at Bessemer or South Pueblo, Col., are turning out one and a half miles of steel railroad bars per day, and have an order in that will run them six months at that.

The Pittsburgh, Cincinnati, and St. Louis Railroad, it is said, are about to begin the erection of shops at a point just east of Indianapolis, Ind. The cost, including machinery, is estimated at $160,000.

According to the Cleveland *Trade Review*, the Middlebrook & Post Manufacturing Company, of Detroit, have orders three months ahead for elevators and hoisting machinery. They employ 25 men.

Parties have been at Grand Crossing, Ill., lately with a view of starting up a new sewing-machine factory in the old Wilson factory, says the *Industrial World*. They expect to be running by November.

It is stated that a company of Ohio capitalists propose to erect a large iron and steel foundry at Chattanooga for the manufacture of iron railing, iron architectural designs, and general work of that character.

The Brown & Adams Manufacturing Company of St. Louis, will soon increase their capital stock and greatly enlarge the capacity of their works by the erection of new buildings and the putting in of new plants of machinery.

The Ottumwa (Ia.) Cutlery Company have commenced the erection of their new works, which will consist of a main building, 100x36 feet, two stories, and a wing 50x36 feet one story, and a stack 9x9 sixty-two feet high, all of brick.

The new shops of the Wilmington and Weldon road, at Wilmington, N. C., are rapidly approaching completion. They are built of brick, are well designed, and when in operation with a full force will be adequate to the requirements of the road.—*National Car Builder.*

A company has been formed at Montgomery, Pa., to erect a planing mill, 80x150 feet. A gentleman outside of this enterprise has bought the site of an old sawmill, and a third party has bought the site of the planing mill that recently burned.

F. O. Sayles has discovered an emery mine on his land, near Savoy, Mass. It has been examined by Geologist Dana, and is pronounced of excellent quality. Mr. Sayles is arranging to have the mine worked and emery wheels manufactured.

The shops of the New Orleans and Northeastern Railroad are to be located at Meridian, Miss., on the land donated by the citizens of that place. The plans are now being prepared in Cincinnati, and work on the buildings will commence in a few weeks.

The Appleton Manufacturing Company, of Appleton, Wis, contemplate the erection of a new two-story building, and propose to enter into the manufacture of wheelbarrows, velocipedes, toys, &c., in addition to the present line of manufacture of agricultural implements.

R. H. Brown & Co., New Haven, Ct., have spent $20,000 to secure the patent on Reid's Chuck, and, as we noted several weeks ago, are erecting new shops with special reference to its manufacture. Felix Chillingworth of that city will have charge of the selling of the chucks.

It is reported that new car works are to be constructed at Curtis Creek, the terminus near Baltimore of the Baltimore and Ohio Railroad; $150,000 of the necessary $300,000 capital having been secured. The Baltimore and Ohio offers to start the works with an order for two thousand cars.

The Dover Rolling Mill, at Canal Dover, Tuscarawas Co., Ohio, was purchased some time ago by Reeves Brothers, of Niles, Ohio, who are removing the machinery to that place. It is stated that the firm will use the machinery to erect a rolling mill at Niles, to manufacture iron plate for their boiler and tank works.

The Black Diamond Steel Works, of this city, with their 17-ton hammer, have just finished the largest steel shaft ever made in the United States. It weighs 28,000 pounds, and is 34 feet 6 inches in length. The dimensions are 16¾ inches hexagon or six-square, tapered down to 14½ inches hexagon at both ends.—*National Labor Tribune, Pittsburgh.*

Pueblo, Col., is soon to have a paper and textile mill, devised to utilize the soap-weed plant that grows so abundant in the southern part of the State. More than three years ago the editor of the *Denver Journal of Commerce* sent large quantities of this soap-weed to Hadley, Mass, to test its adaptation to paper purposes. This mill at Pueblo will be the result of that experimenting.

Fisherville, N. H., is to have a new cotton mill. Plans have been drawn for the buildings, and the company, to be known as the Tohanto Cotton Mill Company, will probably be incorporated at once. Building operations will at once begin, and the mill, which will be of brick, is expected to be completed before winter. Four hundred operatives will be employed, and the number of spindles will be 17,500.

The T. H. Paul Locomotive Works have been purchased for $15,000 cash, by Matthai, Ingram & Co, who will fill the entire establishment with new machinery for the manufacture of all kinds of tinware. The new and costly machinery that was put into the works about six months ago, when they were first built, for manufacturing locomotives and engines, and which has never been used, will be sold very soon.—*Baltimore Manufacturers' Record.*

The M. T. Davidson Steam Pump Company, of Brooklyn, have been awarded another contract for a pumping engine for that city. It is to pump 5,000,000 gallons every twenty-four hours, and is to be done in forty days from the time the contract was secured. Their shop is full of work on steam pumps and water-works pumping engines. A. H. Martine, noticed in our last issue in connection with a test of their pumping machinery, is chief engineer of the Fall River Water Works, instead of the Buffalo Water Works, as inadvertently printed.

The shops of the Pittsburgh, McKeesport, and Youghiogheny railroad will be established at Dawson Station, Pa., a large area of ground opposite the town having been purchased for that purpose. The plans of the company, as they are at present, are to erect two long side tracks and fit them up with scales large enough to weigh loaded coke cars. Opposite the new tracks will be erected a machine shop 36x62 feet and a round-house of twelve stalls. Part of the round-house will be used as a car repair shop until other facilities can be added. Water tanks and turn-tables will also be erected, and a covered platform 30x300 feet to store coal and supplies. The space east of these improvements will be reserved for other shop room.—*Railway Age.*

Russell & Co., Massillon, O., report business better than last year. They have sold out everything in stock and are now turning out sixty-five to seventy engines and boilers per month, beside stationary boilers, sawmills, threshers, and horse-powers. The company have just finished a large warehouse at St. Paul, as a point of distribution for the Northwest, and, in addition to their immense warehouse at the works, built two years since, they are now building a second large warehouse, 300 feet front by 100 deep and three stories front. They are also building a large three-story fireproof storehouse for patterns, beside putting new roofs on both the blacksmith shop and foundry. They are about to increase their equipment of tools in same departments, preparatory for next season's trade.

Machinists' Supplies and Iron.

NEW YORK, September 6, 1883.

The supply business shows a moderate improvement, but users are as a rule buying in small quantities. Manufacturers of specialties usually handled by supply dealers very generally note an increase in their orders, while the buying for quick use that has prevailed during the summer leaves small stocks in the hands of users, and hence has an immediate influence on manufacturing. Altogether, the prospects for future business are fairly bright.

The Pratt & Whitney Company, Hartford, Ct., have issued a new and enlarged illustrated catalogue and price-list containing several new machines recently brought out. The catalogue contains nearly two hundred pages, and is indexed for easy reference.

In American pig iron the indications are that the supply is rather in excess of the demand, and prices rather in favor of buyers. In prices we quote: No. 1 X foundry, $21.50 to $22.50; No. 2 X foundry, $19.50 to $20.50; Grey forge $17.00 to $18.50.

In Scotch pig the market is weak and irregular. We quote Coltness $23.50 from yard $23 to arrive; Glengarnock, $23 at yard; Gartsherrie, $23.50; Summerlee, $22.50; Eglinton, $20.50 to $21.

Steel rails are held at $38 for fall delivery, but buyers are inclined to wait for lower prices.

Antimony—Hallett's, 9c. to 9¼c.; Cookson's, 10c to 10⅛c.

Copper is quiet, with sales of Lake at 15¼c. to 15¼c., other brands 14c.to 14½c. Lead 4.30c. to 4.35c.

Spelter—Refined, 8c. to 8¾c.; Silesian, 5c to 5⅛c.

Tin is moderately firm at jobbing lots of Banca, 22c.; Straits and Malacca, 21¼c. to 21⅜c.

Boiler Plate sells as follows: Tank. 2¼c. to 2¾c.; Refined, 2¾c. to 2 9-10c.; Shell, 3¼c. to 3⅜c.; Flange, 4¼c. to 4⅜c.; extra Flange and Fire Box, 5¼c. to 5⅛.; Siemens Steel Plate, 5¼c. to 6c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue

A mechanical draughtsman, of good technical education and experience, desires a situation. Address "Draughtsman," P. O. D 38, New Haven, Ct.

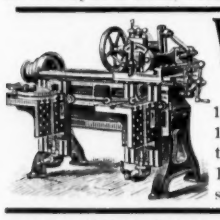
Mechanical draughtsman, thorough in designing stationary and portable engine and sawmill work, good references, wants engagement. Address Engineer, care AM. MACHINIST.

Wanted—Situation as superintendent or foreman. A practical, wide-awake man will be at liberty October 1st, and desires a situation as above. Good references given. Address, Box 2, care AMERICAN MACHINIST.

A gentleman, for many years engaged in commission business in Britain, where he is well localized and having influence, and occasionally undertook business trips to the European Continent in commercial and technical capacity, seeks an agency for a first-class manufacturing firm, corporation, or patentee, with England as a residental center. The subscriber has spent a year and a half in America, and is at present engaged as traveling agent for an American firm. First class city references and reliable valuable testimonials as to ability and character. Address T., Box 10, AMERICAN MACHINIST.

Wanted—A partner, a practical machinist, with about $1,800 capital. Address, Lock Box 97, Laconia, N. H.

Manufacturing property for sale, 30,000 feet floor space, competing point for four trunk lines railroads, switch from door. Write for terms and description B. W. Payne & Sons, Corning, N. Y.



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together with 5 ft. Radial Drill, illustrated in the issue Aug. 18, are a specialty.

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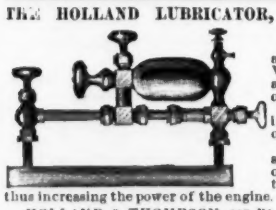

Is guaranteed to be
1. A perfect insurance against the cutting of Valve-seats, Cylinder and Governor Valves of the engine.
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3 It will insure more speed in the revolutions of the engine, say from 1 to 2 strokes per minute, thus increasing the power of the engine. Manufactured by

HOLLAND & THOMPSON, 217 River St., Troy, N. Y

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For STEEP and FLAT ROOFS of all kinds; can be applied by ordinary workmen at ONE THIRD the cost of TIN. Send for a sample and our circular which gives full directions how to apply your own roof; also how to repair leaky roofs of all kinds. Address,

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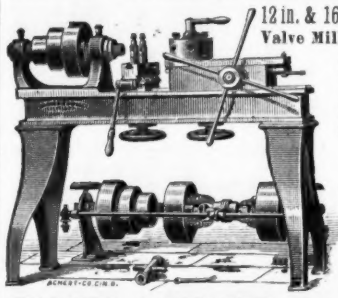

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COOKE & CO., DEALERS IN

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The Waters Perfect Governor.

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Please send for circular and state that you saw the advertisement in this paper.

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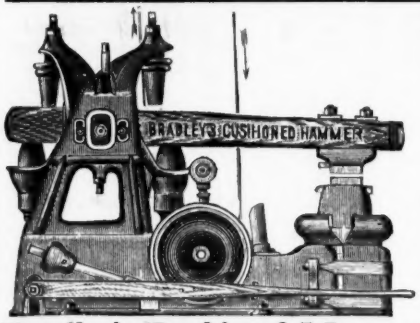
Die Stocks,
For threading and cutting off pipe without the aid of vise. Only one man required to thread 6 in. pipe.



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OVER 800 IN USE.
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For Mining, Railroad or Steamboat use, Paper Mill, Chemical or Gas Works Tannery, Brewery or Sugar Refinery. Draining Quarries, Cellars or Plantations, Irrigating or Hydraulic Mining, Sinking Foundations, Cofler Dam, Sewer, Well Sinking and other Contractors' Work, or Raising Water for any kind of Manufacturing or Fire Purpose, write for an illustrated descriptive book on the New Pulsometer, containing greatly reduced prices, hundreds of testimonials, etc. Mailed free. Prices 100 per cent lower than other Every pump tested before shipment and guaranteed as represented Economy and Efficiency Unequalled. Pulsometer Steam Pump Co., 83 John St., N.Y See prices next issue of this paper

"COMPOUND" BOILER;

HOW TO USE IT AND RUN IT AT SEA.

Explaining causes of all corrosion and the formation of scale, with instructions for its entire prevention, together with useful information for maintaining Steam at Sea. Illustrated. Ly a Sea-going Engineer. 8vo, paper, 40 cents.

E. & F. N. SPON, 35 Murray St., N. Y.

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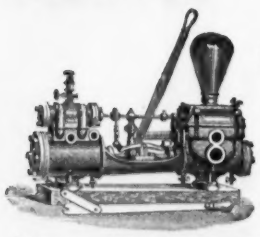

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Estimates furnished on application for Pumping Machinery of any capacity, and to work against any pressure.

Air Pumps and Condensers for Steam Engines a specialty. Will save from 20 to 30 per cent. fuel.

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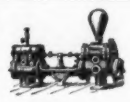

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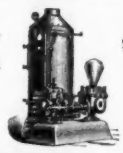

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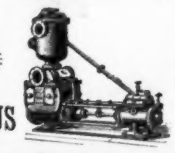

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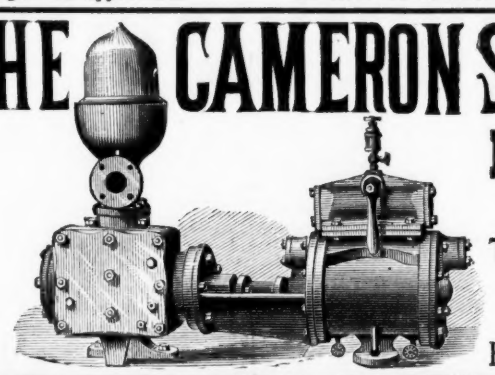

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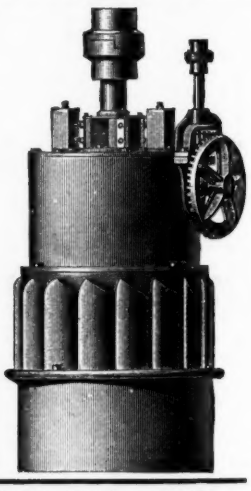

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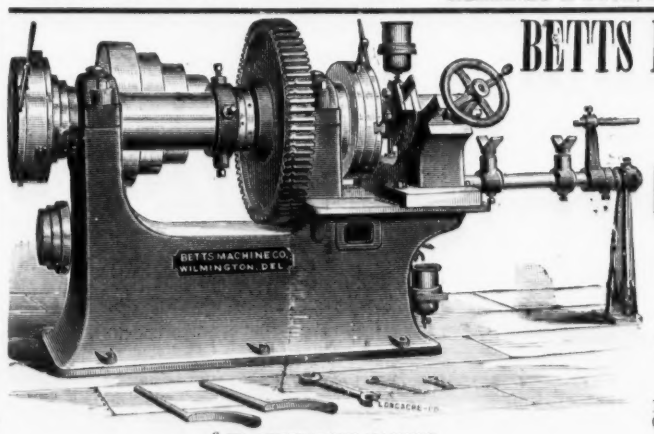

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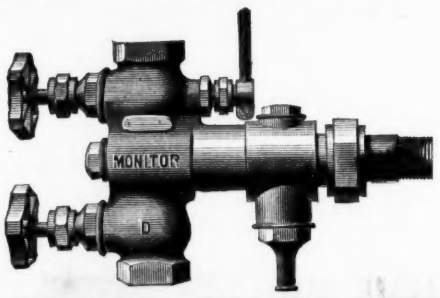

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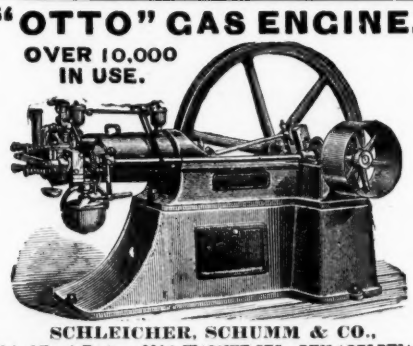

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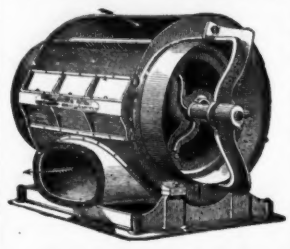

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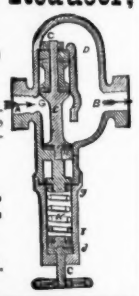

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" 10	1 1-2 "	1.10
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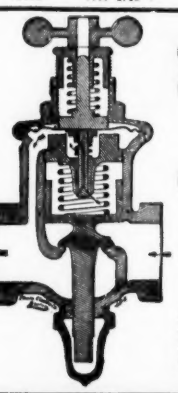

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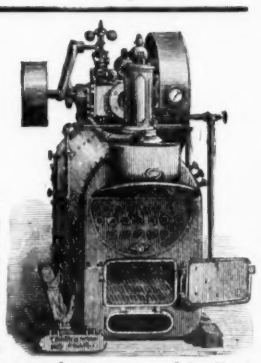

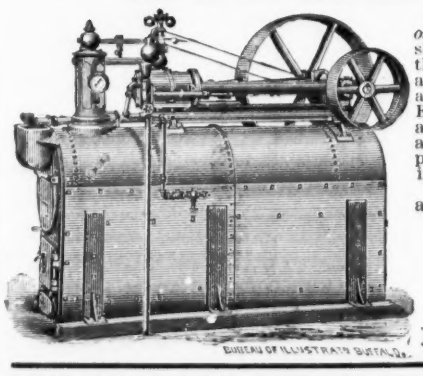

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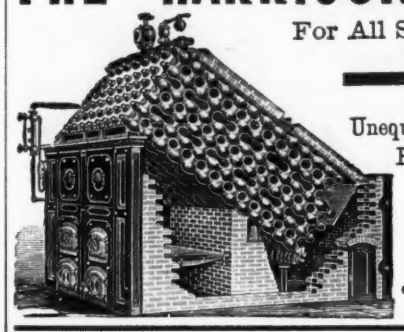

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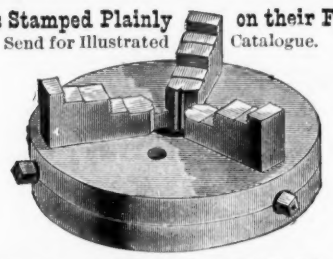

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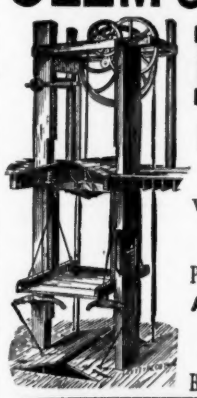

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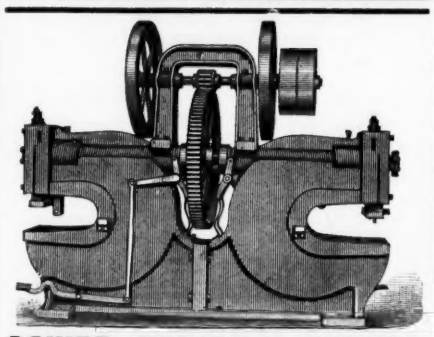

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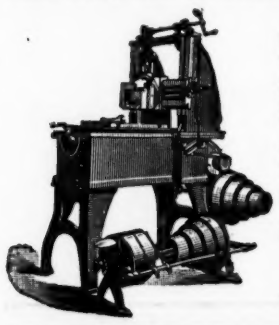

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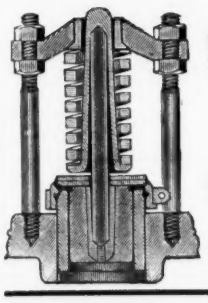

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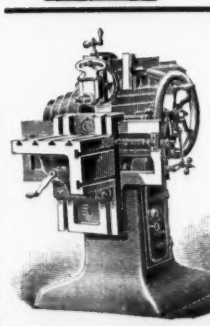

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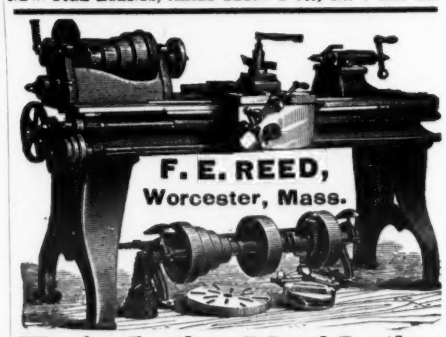

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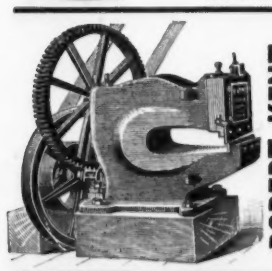

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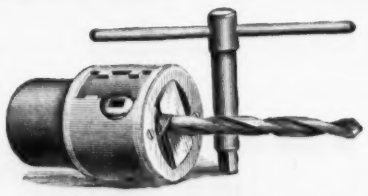

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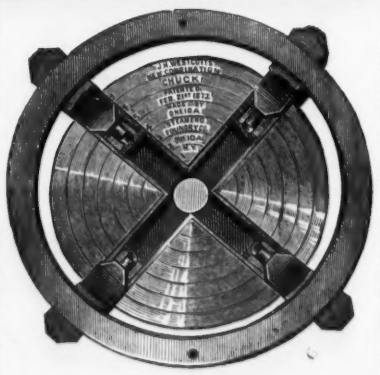

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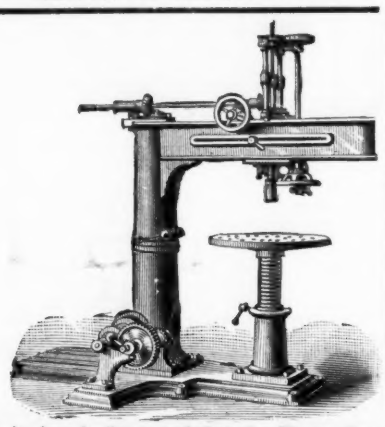

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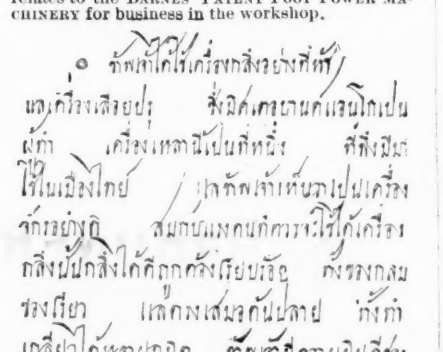

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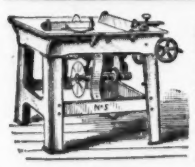

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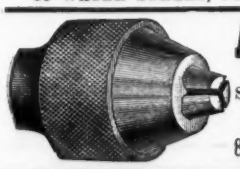

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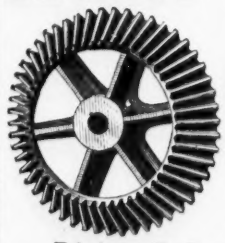

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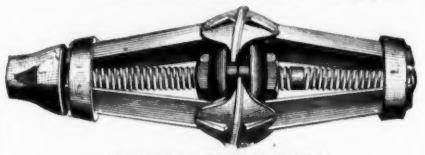

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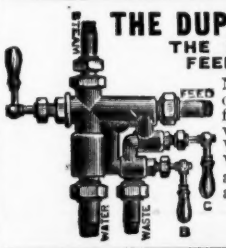

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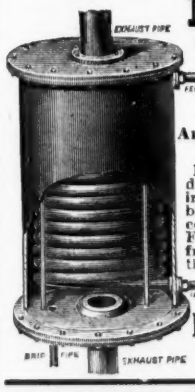

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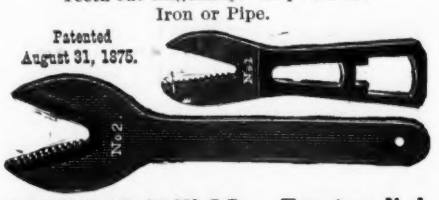

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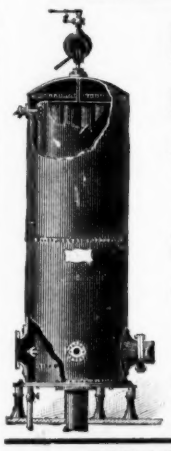

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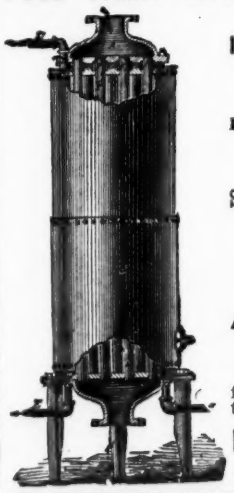

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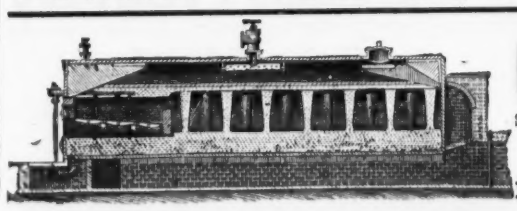

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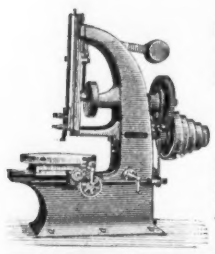

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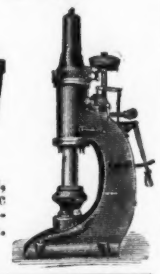

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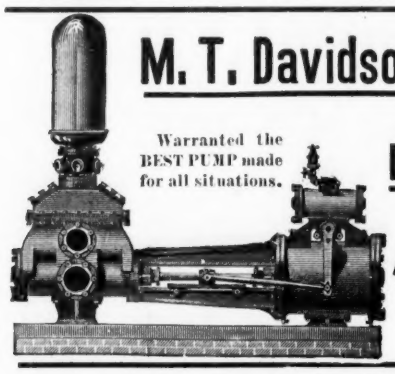

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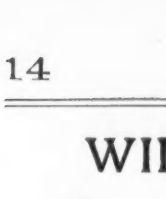

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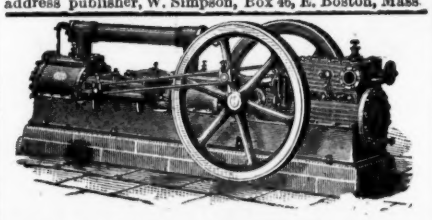

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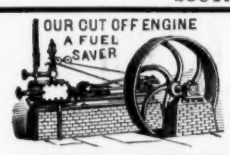

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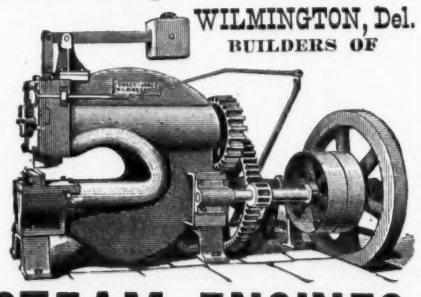

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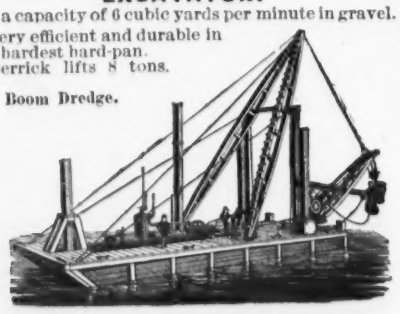

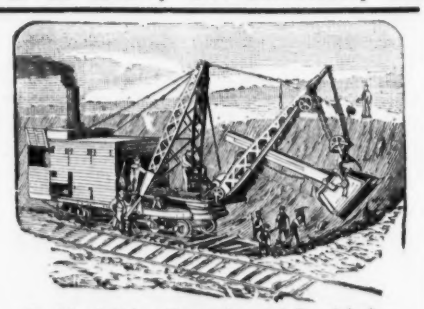

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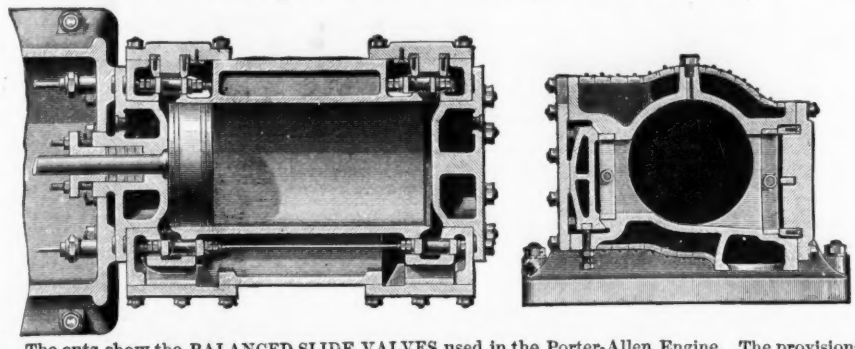

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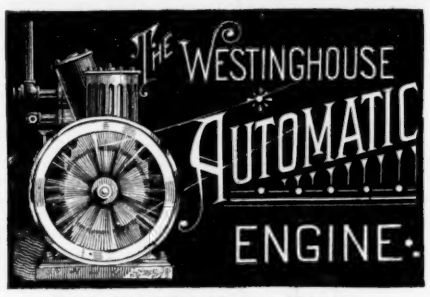

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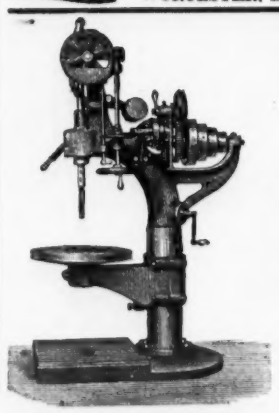

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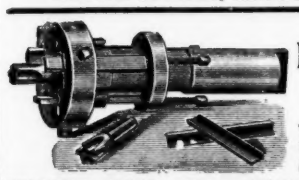

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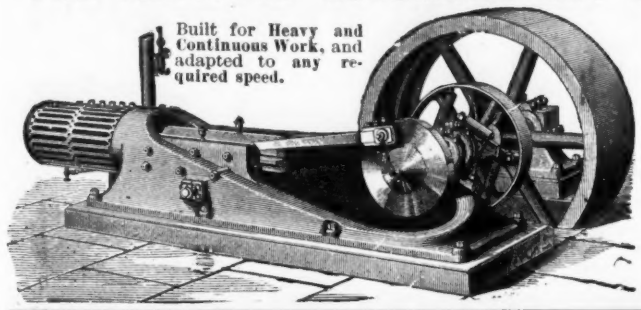

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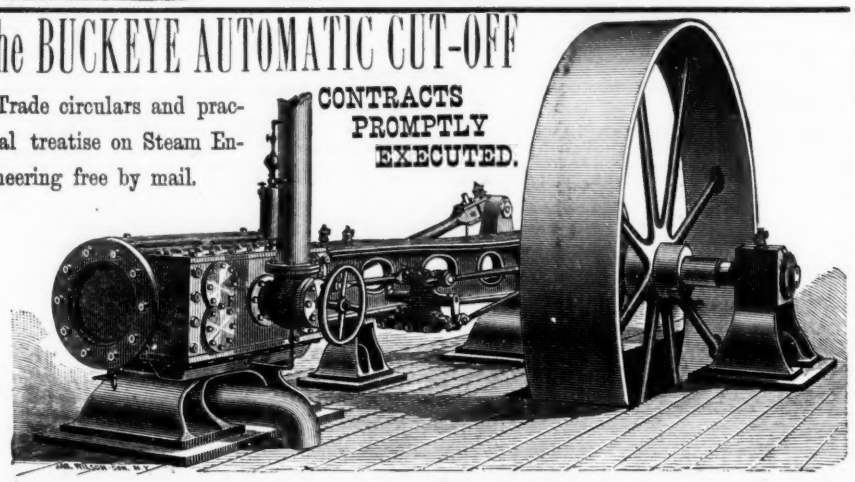

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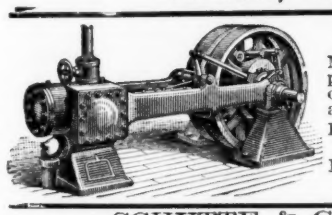

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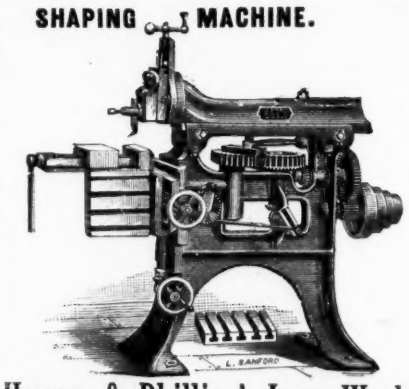

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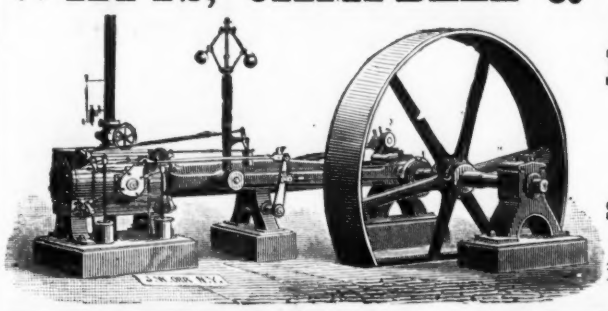

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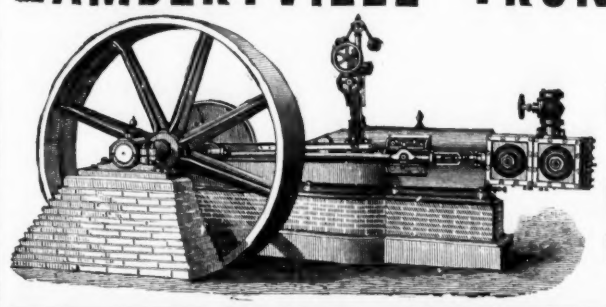

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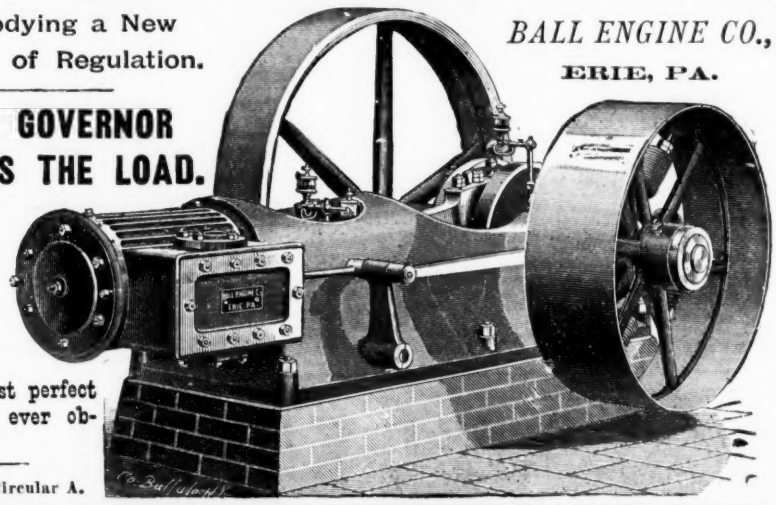

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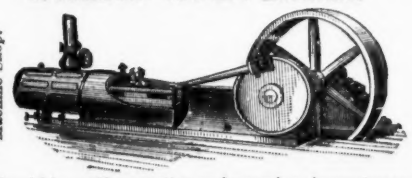

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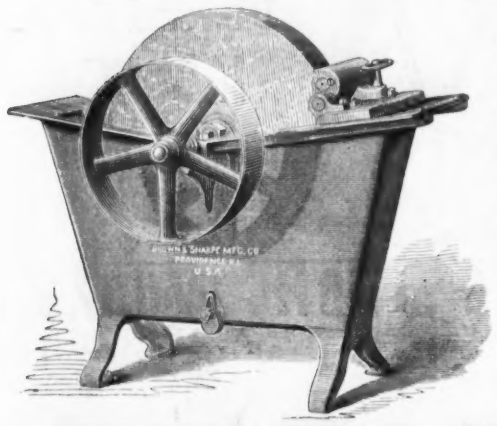

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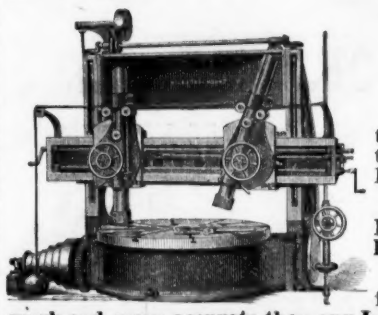

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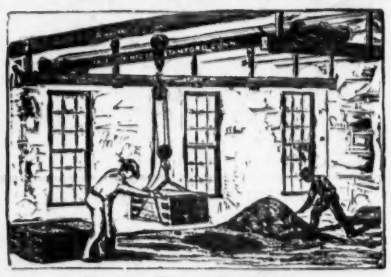

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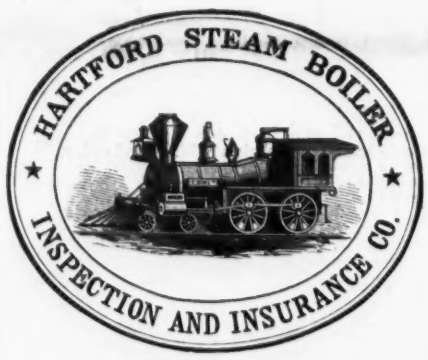

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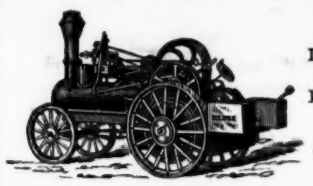

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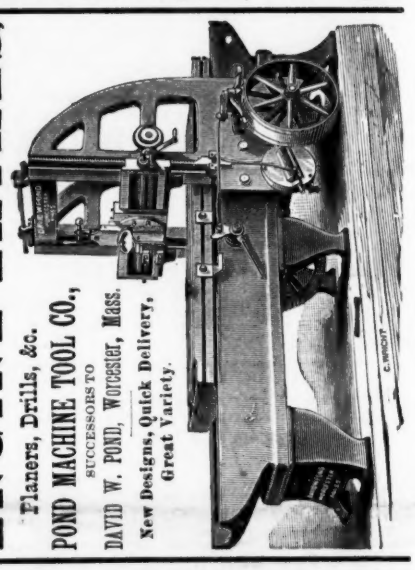

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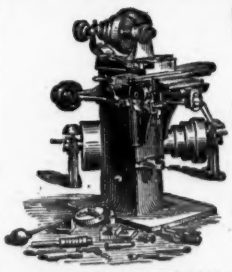

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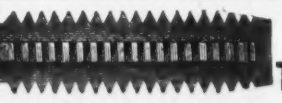

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